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(71) Applicant (*for all designated States except US*): G.D. SEARLE & CO. [US/US]; Corporate Patent Department, P.O. Box 5110, Chicago, IL 60680-5110 (US).

(72) Inventors; and
(75) Inventors/Applicants (*for US only*): BUNCH, Roderick, T. [US/US]; 1540 W. Dempster, Apt. 203, Mt. Prospect, IL 60056 (US). CURTIS, Sandra, W. [US/US]; 255 Creiner Court, Ellisville, MO 63021 (US). RODI, Charles, P. [US/US]; 706 E. Pacific Avenue, St. Louis, MO 63119 (US). MORRIS, Dale, L. [US/US]; 1754 Highview Circle Court, Ballwin, MO 63021 (US).

(74) Agents: WILLIAMS, Roger, A. et al.; G.D. Searle & Co., Corporate Patent Department, P.O. Box 5110, Chicago, IL 60680-5110 (US).

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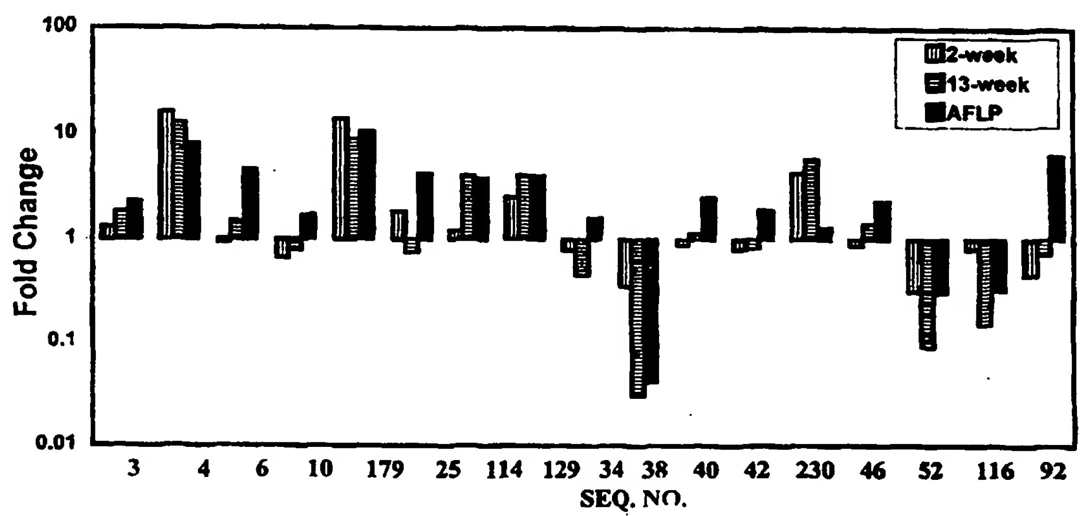

(57) Abstract

The present invention relates to carcinogenesis biomarkers produced by phenobarbitol-treated rat hepatocytes, nucleic acid molecules that encode carcinogenesis biomarkers or a fragment thereof and nucleic acid molecules that are useful as probes or primers for detecting or inducing carcinogenesis, respectively. The invention also relates to applications of the factor or fragment such as forming antibodies capable of binding the carcinogenesis biomarkers or fragments thereof.

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BIOMARKERS AND ASSAYS FOR CARCINOGENESIS

Field of the Invention

The present invention relates to genes differentially regulated by phenobarbital, nucleic acid molecules or fragments thereof that act as biomarkers for carcinogenesis, and nucleic acid molecules that are useful as probes or primers for detecting or inducing carcinogenesis, respectively. The invention also relates to applications such as forming antibodies capable of binding carcinogenesis biomarkers or fragments thereof.

Background

In the field of toxicology, high resolution assays now make it possible to discover differences in gene expression brought on by exposure to a particular xenobiotic. Such high-throughput, high-resolution molecular biology methods can be used to determine virtually all toxicant-induced changes in gene expression. A catalog of toxicant-induced gene expression changes would be useful to better predict animal toxicity in order to reduce costs, timelines, and animal use by enhancing the probability that product candidates chosen for further development will pass regulatory testing requirements. Such a catalog would also enable scientists to better predict human toxicity, resulting in fewer compounds failing in clinical trials while better safeguarding human health.

The basis for these types of investigations is the expectation that toxicological endpoints (e.g. tumor formation) are the result of earlier molecular events. For example, by creating a catalog of changes in rat liver gene expression following treatment with phenobarbital, one can test whether early gene expression

is as predictive as later readouts in assessing the nongenotoxic carcinogenicity of this compound in rats.

The power of transcriptional genomic analyses is that they can measure changes in the expression of thousands of genes, and a comprehensive catalog of expression changes can be envisioned. Using the same catalog of changes, other known nongenotoxic carcinogens (NGCs) could be assessed, as well as compounds known not to be NGCs in rats. Analysis of correlations between the changes and carcinogenesis, as well as analysis of the biological significance of the genes, should indicate whether there are specific genes or gene-expression patterns that predict carcinogenesis. Thus, there is a need in the art for catalogs or panels of predictive markers. Such panels of expressed genes would allow one to examine a greater number of candidate compounds in a shorter period of time prior to selecting a lead compound for traditional testing. As a result of this screening approach, the success rate of compounds in pre-clinical trials should improve dramatically.

These panels of predictive markers could also be used to assess the use of primary rat hepatocytes in high-throughput cell-based assays of toxicity and carcinogenicity. This would further increase the number of compounds that could be assessed, perhaps to the point where entire compound libraries could be assayed, and scores for potential toxicities could be created for each compound. Further, parallel analyses using both animal and human genes could be used to correlate the results from pre-clinical in vivo and in vitro data (using both cultured animal and cultured human cells) with human clinical data to create assays that better predict human toxicity.

Summary Of The Invention

It is an object of the present invention to provide a catalog or panel of changes in gene expression that are predictive of carcinogenicity. The catalog

includes substantially-purified nucleic acid sequences that have been discovered. In one embodiment, the present invention relates to a substantially-purified nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ NO: 1 through SEQ NO: 580 or fragments, substantial homologues, and substantial complements thereof.

In another embodiment, the present invention relates to a substantially-purified carcinogenesis biomarker or fragment thereof encoded by a first nucleic acid molecule which substantially hybridizes to a second nucleic acid molecule, the second nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ NO:1 through SEQ NO:580 and complements thereof.

It is another object of the present invention to provide an assay for toxicity to predict the carcinogenicity of a composition. In a further embodiment, the present invention relates to a method for measuring the carcinogenicity of a composition comprising exposing a mammal to the composition; and determining the presence or absence of mRNA which substantially hybridizes to a nucleic acid sequence selected from the group consisting of SEQ NO:1 through SEQ NO:580 and complements thereof.

It is a further object of the present invention to provide a quantitative and qualitative method of detection of carcinogenesis-related proteins or peptides of the present invention. In one embodiment, antibodies, proteins, peptides, or fusion proteins that specifically bind to one or more of the proteins encoded by the nucleic acid molecules of the present invention can be used to measure the cacinogenesis-related proteins.

Various other objects and advantages of the present invention will become apparent from the following figures and description of the invention.

Brief Description of the Drawings

Figure 1 shows a comparison of mRNA levels of differentially expressed transcripts.

Detailed Description Of The Invention

A. General Concepts and Definitions

These detailed descriptions are presented for illustrative purposes only and are not intended as a restriction on the scope of the invention. Rather, they are merely some of the embodiments that one skilled in the art would understand from the entire contents of this disclosure. All parts are by weight and temperatures are in Degrees centigrade unless otherwise indicated.

Abbreviations and Definitions

The following is a list of abbreviations and the corresponding meanings as used interchangeably herein:

IMDM = Iscove's modified Dulbecco's media

mg = milligram

ml or mL = milliliter

µg or ug= microgram

µl or ul = microliter

ODNs= oligonucleotides

PCR= polymerase chain reaction

RP-HPLC = reverse phase high performance liquid chromatography

The following is a list definitions of various terms used herein:

The term "**altered**" means that expression differs from the expression response of cells or tissues not exhibiting the phenotype.

The term "**amino acid(s)**" means all naturally occurring L-amino acids.

The term "**biologically active**" means activity with respect to either a structural or a catalytic attribute, which includes the capacity of a nucleic acid to hybridize to another nucleic acid molecule, or the ability of a protein to be bound by an antibody (or to compete with another molecule for such binding), among others. Catalytic attributes involve the capacity of the agent to mediate a chemical reaction or response.

The term "**cluster**" means that BLAST scores from pairwise sequence comparisons of the member clones are similar enough to be considered identical with experimental error.

The term "**complement**" means that one nucleic acid exhibits complete complementarity with another nucleic acid.

The term "**complementarity**" means that two molecules can hybridize to one another with sufficient stability to permit them to remain annealed to one another under conventional high stingency conditions.

The term "**complete complementarity**" means that every nucleotide of one molecule is complementary to a nucleotide of another molecule.

The term "**degenerate**" means that two nucleic acid molecules encode for the same amino acid sequences but comprise different nucleotide sequences (see US Patent 4,757,006).

The term "**exogenous genetic material**" means any genetic material, whether naturally occurring or otherwise, from any source that is capable of being inserted into any organism.

The term "**expression response**" means the mutation affecting the level or pattern of the expression encoded in part or whole by one or more nucleic acid molecules.

The term "**fragment**" means a nucleic acid molecule whose sequence is shorter than the target or identified nucleic acid molecule and having the identical, the

substantial complement, or the substantial homologue of at least 7 contiguous nucleotides of the target or identified nucleic acid molecule.

The term "**fusion protein**" means a protein or fragment thereof that comprises one or more additional peptide regions not derived from that protein. Such molecules may be derivatized to contain carbohydrate or other moieties (such as keyhole limpet hemocyanin, etc.).

The term "**hybridization probe**" means any nucleic acid capable of being labeled and forming a double-stranded structure with another nucleic acid over a region large enough for the double stranded structure to be detected.

The term "**isolated**" means an agent is separated from another specific component with which it occurred. For example, the isolate material may be purified to essential homogeneity, as determined by PAGE or column chromatography, such as HPLC. An isolated nucleic acid can comprise at least about 50, 80, or 90% (on a molar basis) of all macromolecular species present. Some of these methods described later lead to degrees of purification appropriate to identify single bands in electrophoresis gels. However, this degree of purification is not required.

The term "**marker nucleic acid**" means a nucleic acid molecule that is utilized to determine an attribute or feature (*e.g.*, presence or absence, location, correlation, etc.) of a molecule, cell, or tissue.

The term "**mimetic**" refers to a compound having similar functional and/or structural properties to another known compound or a particular fragment of that known compound.

The term "**minimum complementarity**" means that two molecules can hybridize to one another with sufficient stability to permit them to remain annealed to one another under at least conventional low stringency conditions.

The term "**PCR probe**" means a nucleic acid capable of initiating a polymerase activity while in a double-stranded structure with another nucleic acid. For

example, Krzesicki, *et al.*, *Am. J. Respir. Cell Mol. Biol.* 16:693-701 (1997), incorporated by reference in its entirety, discusses the preparation of PCR probes for use in identifying nucleic acids of osteoarthrits tissue. Other methods for determining the structure of PCR probes and PCR techniques have been described.

The term "**phenotype**" means any of one or more characteristics of an organism, tissue, or cell.

The term "**polymorphism**" means a variation or difference in the sequence of the gene or its flanking regions that arises in some of the members of a species.

The term "**primer**" means a single-stranded oligonucleotide which acts as a point of initiation of template-directed DNA synthesis under appropriate conditions (e.g., in the presence of four different nucleoside triphosphates and an agent for polymerization, such as, DNA or RNA polymerase or reverse transcriptase) in an appropriate buffer and at a suitable temperature. The appropriate length of a primer depends on the intended use of the primer, but typically ranges from 15 to 30 nucleotides. Short primer molecules generally require cooler temperatures to form sufficiently stable hybrid complexes with the template. A primer need not reflect the exact sequence of the template, but must be sufficiently complementary to hybridize with a template.

The term "**probe**" means an agent that is utilized to determine an attribute or feature (e.g. presence or absence, location, correlation, etc.) of a molecule, cell, tissue, or organism.

The term "**product score**" refers to a formula which indicates the strength of a BLAST match using the fraction of overlap of two sequences and the percent identitiy. The formula is as follows:

$$\text{Product Score} = \frac{\text{BLAST Score x Percent Identity}}{5 \text{ x minimum}\{\text{length(Seq1), length(Seq2)}\}}$$

The term "**promoter region**" means a region of a nucleic acid that is capable, when located in *cis* to a nucleic acid sequence that encodes for a protein or peptide, of functioning in a way that directs expression of one or more mRNA molecules.

The term "**protein fragment**" means a peptide or polypeptide molecule whose amino acid sequence comprises a subset of the amino acid sequence of that protein.

The term "**protein molecule/peptide molecule**" means any molecule that comprises five or more amino acids.

The term "**recombinant**" means any agent (e.g., DNA, peptide, etc.), that is, or results from, however indirectly, human manipulation of a nucleic acid molecule. The recombination may occur inside a cell or in a tube.

The term "**selectable marker**" means a gene who's expression can be detected by a probe as a means of identifying or selecting for transformed cells.

The term "**specifically bind**" means that the binding of an antibody or peptide is not competitively inhibited by the presence of non-related molecules.

The term "**specifically hybridizing**" means that two nucleic acid molecules are capable of forming an anti-parallel, double-stranded nucleic acid structure.

The term "**substantial complement**" means that a nucleic acid sequence shares at least 80% sequence identity with the complement.

The term "**substantial fragment**" means a fragment which comprises at least 100 nucleotides.

The term "**substantial homologue**" means that a nucleic acid molecule shares at least 80% sequence identity with another.

The term "**substantial identity**" means that 70% to about 99% of a region or fragment in a molecule is identical to a region of a different molecule. When the individual units (e.g., nucleotides or amino acids) of the two molecules are schematically positioned to exhibit the highest number of units in the same position over a specific region, a percentage identity of the units identical over the total

number of units in the region is determined. Numerous algorithmic and computerized means for determining a percentage identity are known in the art. These means may allow for gaps in the region being considered in order to produce the highest percentage identity.

The term "**substantially hybridizes**" means that two nucleic acid molecules can form an anti-parallel, double-stranded nucleic acid structure under conditions (e.g. salt and temperature) that permit hybridization of sequences that exhibit 90% sequence identity or greater with each other and exhibit this identity for at least a contiguous 50 nucleotides of the nucleic acid molecules.

The term "**substantially purified**" means that one or more molecules that are or may be present in a naturally occurring preparation containing the target molecule will have been removed or reduced in concentration.

Agents of the Invention

A. Nucleic Acid Molecules

The present invention relates to nucleic acid sequences selected from the group consisting of SEQ NO:1 through SEQ NO: 580, substantial fragments thereof, substantial homologues thereof, and substantial complements thereof. By creating a catalog of changes in rat liver gene expression following treatment with phenobarbital, substantially-purified nucleic acid sequences selected from the group consisting of SEQ NO: 1 through SEQ NO: 580 have been discovered. These sequences are useful as biomarkers of carcinogenesis.

The present invention also relates to nucleic acid sequences derived from the one or more sequences identified in SEQ NOS:1-580. Fragment nucleic acids may encompass significant portion(s) of, or indeed most of, these sequences. For example, a fragment nucleic acid can encompass an carcinogenesis biomarker gene homolog or fragment thereof. Alternatively, the fragments may comprise smaller

oligonucleotides, for example an oligonucleotide having from about 10 to about 250 nucleotides or from about 15 to about 30 nucleotide.

A variety of computerized means for identifying sequences derived from the SEQ NO.: 1-580 exists. These include the five implementations of BLAST, three designed for nucleotide sequences queries (BLASTN, BLASTX, and TBLASTX) and two designed for protein sequence queries (BLASTP and TBLASTN), as well as FASTA and others (Coulson, *Trends in Biotechnology* 12:76-80 (1994); Birren *et al., Genome Analysis* 1:543-559 (1997)). Other programs which use either individual sequences or make models from related sequences to further identify sequences derived from SEQ NO 1- SEQ NO 580 exist. Model building and searching programs includes HMMer (Eddy), MEME (Bailey and Elkan, *Ismb* 3: 21-29 (1995)) and PSI-BLAST (Altschul et al., *Nucleic Acids Res* 25: 3389-3402 (1997)). Another set of programs which use predicted, related, or known protein structures to further identify sequences derived from SEQ NO 1- SEQ NO 580 exists. Structure-based searching programs includes ORF and PROSITE. Other programs which use individual sequences or related groups of sequences relying on pattern discovery to further identify sequences derived from SEQ NO:1-580 exist. Pattern recognition programs include Teiresias (Rigoutsos, I. and A. Floratos, *Bioinformatics* 1: (1998)). These programs can search any appropriate database, such as GenBank, dbEST, EMBL, SwissProt, PIR, and GENES. Furthermore, computerized means for designing modifications in protein structure are also known in the art (Dahiyat and Mayo, *Science* 278:82-87 (1997)).

Nucleic acids or fragments thereof of the present invention are capable of specifically hybridizing to other nucleic acids under certain circumstances. The present invention further relates to nucleic acid sequences that will specifically hybridize to one or more of the nucleic acids set forth in SEQ NO: 1 through SEQ NO: 580, or complements thereof, under moderately stringent conditions, for

example at about 2.0 X SSC and about 65°C. Alternatively, the nucleic acid sequences of the present invention may specifically hybridize to one or more of the nucleic acids set forth in SEQ NO:1 through SEQ NO: 580, or complements thereof, under high stringency conditions.

The present invention also relates to nucleic acid sequences that share between 100% and 90% sequence identity with one or more of the nucleic acid sequences set forth in SEQ NO: 1 through to SEQ NO: 580 or complements thereof. In a further aspect of the invention, nucleic acid sequences of the invention share between 100% and 95% sequence identity with one or more of the nucleic acid sequences set forth in SEQ NO: 1 through SEQ NO: 580, or complements thereof. Alternatively, nucleic acid sequences of the present invention may share between 100% and 98% or between 100% and 99% sequence identity with one or more of the nucleic acid sequences set forth in SEQ NO: 1 through SEQ NO: 580, or complements thereof.

A region or fragment in a molecule with "substantial identity" to a region of a different molecule can be represented by a ratio. In a preferred embodiment, a 10 nucleotide in length nucleic acid region or fragment of the invention has a percentage identity of about 70% to about 99% with a nucleic acid sequence existing within one of SEQ NO.: 1-580 or a complement of SEQ NO.: 1-580.

The invention also provides a computer-readable medium having recorded thereon the sequence information of one or more of SEQ NO:1 through SEQ NO:580, or complements thereof. In addition, the invention provides a method of identifying a nucleic acid comprising providing a computer-readable medium of the invention and comparing nucleotide sequence information using computerized means.

i. Nucleic Acid Primers and Probes

The present invention also relates to nucleic acid primers and probes derived from the nucleic acid sequences set forth in SEQ NO: 1 through SEQ NO: 580. The nucleic acid primers and probes of the invention may be derived from the disclosed sequences, such as a fragment of 10 nucleotides or more or a sequence with 70% to 99% identity to a fragment of at least 10 nucleotides. Numerous methods for defining or identifying primers and probes for nucleic acid or sequence based analysis exist. Examples of suitable primers include, but are not limited to, the nucleic acid sequences set forth in SEQ NO: 519 through SEQ NO: 580. Examples of 5' primers (from the 5' to 3' direction) include, but are not limited to, SEQ NO: 550-580. Examples of 3' primers (from the 5' to 3' direction) include, but are not limited to, SEQ NO: 519-549. Examples of suitable probes include, but are not limited to, the nucleic acid sequences set forth in SEQ NO: 490 through SEQ NO: 518. The genes that corresponds to the primer and probe sequences (SEQ NO: 490-580) are described in Table 7.

Conventional stringency conditions are described by Sambrook, *et al.*, *Molecular Cloning, A Laboratory Manual*, 2nd Ed., Cold Spring Harbor Press, Cold Spring Harbor, New York (1989), and by Haymes, *et al. Nucleic Acid Hybridization, A Practical Approach*, IRL Press, Washington, DC (1985), the entirety of both is herein incorporated by reference. Departures from complete complementarity are therefore permissible, as long as such departures do not completely preclude the capacity of the molecules to form a double-stranded structure. Thus, in order for a nucleic acid molecule to serve as a primer or probe it need only be sufficiently complementary in sequence to be able to form a stable double-stranded structure under the particular solvent and salt concentrations employed.

Appropriate stringency conditions that promote DNA hybridization, for example, 6.0 X sodium chloride/sodium citrate (SSC) at about 45°C, followed by a wash of 2.0 X SSC at 50°C, are known to those skilled in the art or can be found in Ausubel, *et al., Current Protocols in Molecular Biology*, John Wiley & Sons, N.Y. (1989) (see especially sections 6.3.1-6.3.6). [This reference and the supplements through January 2000 are specifically incorporated herein by reference and can be relied to make or use any embodiment of the invention.] For example, the salt concentration in the wash step can be selected from a low stringency of about 2.0 X SSC at 50°C to a high stringency of about 0.2 X SSC at 50°C. In addition, the temperature in the wash step can be increased from low stringency conditions at room temperature, about 22°C, to high stringency conditions at about 65°C. Temperature and salt conditions may be varied independently.

Primers and probes of the present invention can be used in hybridization assays or techniques, in a variety of PCR-type methods, or in computer-based searches of databases containing biological information. Exemplary methods include a method of identifying a nucleic acid which comprises the hybridization of a probe of the invention with a sample containing nucleic acid and the detection of stable hybrid nucleic acid molecules. Also included are methods of identifying a nucleic acid comprising contacting a PCR probe of the invention with a sample containing nucleic acid and producing multiple copies of a nucleic acid that hybridizes, or is at least minimally complementary, to the PCR probe.

The primers and probes of the invention may be labeled with reagents that facilitate detection (e.g., fluorescent labels, Prober et al., Science 238: 336-340 (1987), Albarella et al., EP 144914;, chemical labels, Sheldon et al., U.S. Patent 4,582,789, Albarella et al., U.S. Patent 4,563,417; and modified bases, Miyoshi et al., EP 119448) all of which are incorporated by reference in their entirety)).

ii. Nucleic Acids Comprising Genes, Fragments, or Homologs Thereof

This invention also provides genes corresponding to the cDNA sequences disclosed herein, also called carcinogenesis biomarkers. The corresponding genes can be isolated in accordance with known methods using the sequence information disclosed herein. The methods include the preparation of probes or primers from the disclosed sequence information for identification and/or amplification of genes in appropriate genomic libraries or other sources of genomic materials.

In another preferred embodiment, nucleic acid molecules having SEQ NO: 1 through SEQ NO: 580, or complements and fragments of either, can be utilized to obtain homologues equivalent to the naturally existing homologues.

In a further aspect of the present invention, one or more of the nucleic acid molecules of the present invention differ in nucleic acid sequence from those encoding a homologue or fragment thereof in SEQ NO: 1 through SEQ NO: 580, or complements thereof, due to the degeneracy in the genetic code in that they encode the same protein but differ in nucleic acid sequence. In another further aspect of the present invention, one or more of the nucleic acid molecules of the present invention differ in nucleic acid sequence from those encoding an homologue of fragment thereof in SEQ NO: 1 through SEQ NO:580, or complements thereof, due to fact that the different nucleic acid sequence encodes a protein having one or more conservative amino acid residue. Examples of conservative substitutions are set forth below. Codons capable of coding for such conservative substitutions are well known in the art.

Original Residue	Conservative Substitutions
Ala	ser
Arg	lys
Asn	gln; his
Asp	glu
Cys	ser; ala
Gln	asn
Glu	asp
Gly	pro
His	asn; gln
Ile	leu; val
Leu	ile; val
Lys	arg; gln; glu
Met	leu; ile
Phe	met; leu; tyr
Ser	thr
Thr	ser
Trp	tyr
Tyr	trp; phe
Val	ile; leu

Genomic sequences can be screened for the presence of protein homologues utilizing one or a number of different search algorithms have that been developed, such as the suite of BLAST programs. The BLASTX program allows the comparison of nucleic acid sequences in this invention to protein databases.

In a preferred embodiment of the present invention, the homologue protein or fragment thereof exhibits a BLASTX probability score of less than 1E-30,

alternatively a BLASTX probability score of between about 1E-30 and about 1E-12 or a BLASTX probability score of greater than 1E-12 with a nucleic acid or gene of this invention. In another preferred embodiment of the present invention, the nucleic acid molecule encoding the gene homologue or fragment thereof exhibits a % identity with its homologue of between about 25% and about 40%, or alternatively between about 40% and about 70%, or from 70% and about 90%, or from about 90% and 99%. In another embodiment, the gene homologue or fragment has a single nucleotide difference from its homologue.

The resulting product score of a BLAST program ranges from 0 to 100, with 100 indicating 100% identity over the entire length of the shorter of the two sequences, and 0 representing no shared identity between the sequences. The homologue protein or fragment thereof may also exhibit a product score of 100. Alternatively, the product score is between about 49 and about 99. The protein or fragment may also exhibit a product score of 0. Alternatively, the homolog or fragment exhibits a product score between about 1 and about 49.

The sequences of the present invention were searched for sequence similarity and given biological annotations based on that similarity.

Table 1: Sequences down-regulated at least 1.7-fold by 13 weeks of treatment with phenobarbitol are shown with their corresponding annotation.

Table 2: Sequences up-regulated at least 1.7-fold by 13 weeks of treatment with phenobarbitol are shown with their corresponding annotation.

Table 3: Sequences down-regulated at least 1.7-fold by 5 weeks of treatment with phenobarbitol are shown with their corresponding annotation.

Table 4: Sequences upregulated at least 1.7-fold by 5 weeks of treatment with phenobarbitol are shown with their corresponding annotation.

iv. Vectors and Host Cells Containing Nucleic Acid Molecules

The present invention also relates to recombinant DNA molecules comprising a nucleic acid sequence of the invention and a vector. The invention further relates to host cells (mammalian and insect) that containing the recombinant DNA molecules. Methods for obtaining such recombinant mammalian host cell, comprising introducing exogenous genetic material into a mammalian host cell are also provided by the invention. The present invention also relates to an insect cell comprising a mammalian cell containing a mammalian recombinant vector. The present invention also relates to methods for obtaining a recombinant mammalian host cell, comprising introducing into a mammalian cell exogenous genetic material.

A recombinant protein may be produced by opererably linking a regulatory control sequence to a nucleic acid of the present invention and putting it into an expression vector. Regulatory sequences include promoters, enhancers, and other expression control elements which are described in Goeddel (*Hene Expression Technology: Methods in Enzymology* 185. Academic Press, San Diego, CA (1990)). For example, the native regulatory sequences or regulatory sequences native to the transformed host cell can be used. One of skill in the art is familiar with numerous examples of these additional functional sequences, as well as other functional sequences, that may optionally be included in an expression vector. The design of the expression vector may depend on such factors as the choice of the host cell to be transformed, and/or the type of protein desired. Many such vectors are commercially available, including linear or enclosed elements (see for example, Broach, et al., Experimental Manipulation of Gene Expression, ed. M. Inouye, Academic Press, (1983); Sambrook, *et al., Molecular Cloning, A Laboratory Manual*, 2nd Ed., Cold Spring Harbor Press, Cold Spring Harbor, New York (1989)). Typically, expression constructs will contain one or more selectable

markers, including the gene that encodes dihydrofolate reductase and the genes that confer resistance to neomycin, tetracycline, ampicillin, chloramphenicol, kanamycin and streptomycin resistance.

Prokaryotic and eukaryotic host cells transfected by the described vectors are also provided by this invention. For instance, cells which can be transfected with the vectors of the present invention include, but are not limited to, bacterial cells such as *E. coli* (e.g., *E. coli* K 12 strains), *Streptomyces*, *Pseudomonas*, *Serratia marcescens* and *Salmonella typhimurium*, insect cells (baculovirus), including *Drosophila*, fungal cells, such as yeast cells, plant cells, and ovary cells (CHO), and COS cells.

One may use different promoter sequences, enhancer sequences, or other sequences which will allow for enhanced levels of expression in the expression host.. Thus, one may combine an enhancer from one source, a promoter region from another source, a 5'- noncoding region upstream from the initiation methionine from the same or different source as the other sequences, and the like. One may provide for an intron in the non-coding region with appropriate splice sites or for an alternative 3'- untranslated sequence or polyadenylation site. Depending upon the particular purpose of the modification, any of these sequences may be introduced, as desired.

Where selection is intended, the sequence to be integrated will have an associated marker gene, which allows for selection. The marker gene may conveniently be downstream from the target gene and may include resistance to a cytotoxic agent, e.g. antibiotics, heavy metals, resistance or susceptibility to HAT, gancyclovir, etc., complementation to an auxotrophic host, particularly by using an auxotrophic yeast as the host for the subject manipulations, or the like. The marker gene may also be on a separate DNA molecule, particularly with primary mammalian cells. Alternatively, one may screen the various transformants, due to

the high efficiency of recombination in yeast, by using hybridization analysis, PCR, sequencing, or the like.

For homologous recombination, constructs can be prepared where the amplifiable gene will be flanked, normally on both sides, with DNA homologous with the DNA of the target region. Depending upon the nature of the integrating DNA and the purpose of the integration, the homologous DNA will generally be within 100 kb, usually 50 kb, preferably about 25 kb, of the transcribed region of the target gene, more preferably within 2 kb of the target gene. Where modeling of the gene is intended, homology will usually be present proximal to the site of the mutation. The term gene is intended to encompass the coding region and those sequences required for transcription of a mature mRNA. The homologous DNA may include the 5'-upstream region outside of the transcriptional regulatory region, or comprise any enhancer sequences, transcriptional initiation sequences, adjacent sequences, or the like. The homologous region may include a portion of the coding region, where the coding region may be comprised only of an open reading frame or combination of exons and introns. The homologous region may comprise all or a portion of an intron, where all or a portion of one or more exons may also be present. Alternatively, the homologous region may comprise the 3'-region, so as to comprise all or a portion of the transcriptional termination region, or the region 3' of this position. The homologous regions may extend over all or a portion of the target gene or be outside the target gene comprising all or a portion of the transcriptional regulatory regions and/or the structural gene.

Thus, the nucleic acid molecules described can be used to produce a recombinant form of the protein via microbial or eukaryotic cellular processes. Ligating the polynucleic acid molecule into a gene construct, such as an expression vector, and transforming or transfecting into hosts, either eukaryotic (yeast, avian, insect, plant, or mammalian) or prokaryotic (bacterial cells), are standard

procedures used in producing other well known proteins. Similar procedures, or modifications thereof, can be employed to prepare recombinant proteins according to the present invention by microbial means or tissue-culture technology. Accordingly, the invention pertains to the production of encoded proteins or polypeptides by recombinant technologies.

B. Proteins and Polypeptides

The present invention also relates to proteins, peptides and polypeptides encoded by the nucleic acid sequences of the invention. Protein and peptide molecules can be identified using known protein or peptide molecules as a target sequence or target motif in the BLAST programs of the present invention. These proteins, peptides and poylpeptides of the invention can be made using the nucleic acids or derived from the sequence information of the nucleic acids are also disclosed in the present invention. This invention also provides a compound or composition comprising one or more polypeptides, which comprise: 1) at least one fragment, segment, or domain of at least 15-1,000 contiguous amino acids, with at least one portion encoded by one or more of SEQ NOS: 1-580; 2) at least one amino acid sequence selected from those encoding at least one of SEQ NOS: 1-580; or 3) at least one modification corresponding to fragments, segments, or domains within one of SEQ NOS:1- 580. The proteins, peptides and polypeptides of the invention can be made recombinantly as described above. Alternatively, the proteins, peptides and polypeptides of the invention can be produced synthetically.

Protein fragments or fusion proteins may be derivatized to contain carbohydrate or other moieties (such as keyhold limpet hemocyanin, etc.). A fusion protein or peptide molecule of the present invention is preferably produced via recombinant means.

Modifications can be naturally provided or deliberately engineered into the nucleic acids, proteins, and polypeptides of the invention to generate variants. For example, modifications in the peptide or DNA sequences can be made by those skilled in the art using known techniques, such as site-directed mutagenesis. Modifications of interest in the protein sequences may include the alteration, substitution, replacement, insertion or deletion of one or more selected amino acid residues. For example, one or more cysteine residues may be deleted or replaced with another amino acid to alter the conformation of the molecule. Additional cysteine residues can also be added as a substitute at sites to promote disulfide bonding and increase stability. Techniques for identifying the sites for alteration, substitution, replacement, insertion or deletion are well known to those skilled in the art. Techniques for making alterations, substitutions, replacements, insertions or deletions (see, e.g., U.S. Pat. No. 4,518,584) are also well known in the art. Preferably, any modification of a protein, polypeptide, or nucleic acid of the invention will retain at least one of the structural or functional attributes of the molecule.

The polypeptide or protein can also be tagged to facilitate purification, such as with histidine- or methionine-rich regions [His-Tag; available from LifeTechnologies Inc, Gaithersvurg, MD] that bind to metal ion affinity chromatography columns, or with an epitope that binds to a specific antibody [Flag, available from Kodak, New Haven, CT].

A number of purification methods or means are also known and can be used. For example, reverse-phase high performance liquid chromatography (RP-HPLC).

C. Antibodies

This invention also provides an antibody, polyclonal or monoclonal, that specifically binds at least one epitope found in or specific to a carcinogenesis

biomarker protein or polypeptide or a protein or polypeptide, of fragment or variant thereof, of this invention. Antibodies can be generated by recombinant, synthetic, or hybridoma technologies. One aspect of the present invention concerns antibodies, single-chain antigen binding molecules, or other proteins that specifically bind to one or more of the protein or peptide molecules of the present invention and their homologues, fusions or fragments. Such antibodies may be used to quantitatively or qualitatively detect the protein or peptide molecules of the present invention.

Nucleic acid molecules that encode all or part of the protein of the present invention can be expressed, by recombinant means, to yield protein or peptides that can in turn be used to elicit antibodies that are capable of binding the expressed protein or peptide. Such antibodies may be used in immunoassays for that protein or peptide. Such protein-encoding molecules or their fragments may be a "fusion" molecule (*i.e.*, a part of a larger nucleic acid molecule) such that, upon expression, a fusion protein is produced. It is understood that any of the nucleic acid molecules of the present invention may be expressed, by recombinant means, to yield proteins or peptides encoded by these nucleic acid molecules.

The antibodies that specifically bind proteins and protein fragments of the present invention may be polyclonal or monoclonal, and may comprise intact immunoglobulins, or antigen binding portions of immunoglobulins (such as (F(ab'), $F(ab')_2$ fragments), or single-chain immunoglobulins producible, for example, via recombinant means. Conditions and procedures for the construction, manipulation and isolation of antibodies (see, for example, Harlow and Lane, *Antibodies: A Laboratory Manual*, Cold Spring Harbor Press, Cold Spring Harbor, New York (1988), the entirety of which is herein incorporated by reference) are well known in the art.

As discussed below, such antibody molecules or their fragments may be used for diagnostic purposes. Where the antibodies are intended for diagnostic purposes, it may be desirable to derivatize them, for example with a ligand group (such as biotin) or a detectable marker group (such as a fluorescent group, a radioisotope or an enzyme).

The ability to produce antibodies that bind the protein or peptide molecules of the present invention permits the identification of mimetic compounds of those molecules. Combinatorial chemistry techniques, for example, can be used to produce libraries of peptides (see WO 9700267), polyketides (see WO 960968), peptide analogues (see WO 9635781, WO 9635122, and WO 9640732), oligonucleotides for use as mimetic compounds derived from this invention. Mimetic compounds and libraries can also be generated through recombinant DNA-derived techniques. For example, phage display libraries (see WO 9709436), DNA shuffling (see US Patent 5,811,238) other directed or random mutagenesis techniques can produce libraries of expressed mimetic compounds. It is understood that any of the agents of the present invention can be substantially purified and/or be biologically active and/or recombinant.

Uses of the Invention

The present invention also provides methods for identifying carcinogen compounds. The nucleic acids, peptides and proteins of the invention can be useful in predicting the toxicity of test compounds. Nucleic acids represent biomarkers which are correlated to an altered cellular state. These markers, individually or in combination, can be measured in response to compounds to screen for those compounds that suppress or activate the genes and thus alter the state of the cell in an undesired manner. Specifically, the nucleic acids, peptides and proteins can be used directly in numerous methods well known in the art to identify or detect the presence of specific nucleic acid or amino acid sequences.

Carcinogens can be identified by contacting an animal, tissue from a mammal, or a mammalian cell, such as a rat hepatocyte, with a compound, under conditions allowing production of mRNA by the cell. The resulting mRNA is then separated and its presence or absence detected. Differential expression of these biomarkers can be monitored in tissues and fluids at the mRNA level using methods well known in the art such as Northern hybridizations, RNAase protection, NMR, rt-PCR, and *in situ* hybridizations. *In vitro* techniques can also be used to detect differential expression of genomic DNA such as, for example, Southern hybridizations.

Similarly, differential expression of these biomarkers can be monitored at the protein level using, for example, enzyme linked immunosorbent assays (ELISAs), Western blots, HPLC-liquid chromotography, NMR, immunoprecipitations and immunofluorescence. Protein identification can also be performed using new techniques including biomolecular interaction analysis (BIA) and matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF). (Nelson *et al.*, Interfacing biomolecular interaction analysis with mass spectrometry and the use of bioreactive mass spectrometer probe tips in protein characterization, in Techniques in Protein Chemistry VIII, p. 493-504, 1997; Kalrsson *et al.*, Experimental design for kinetic analysis of protein-protein interactions with surface plasmon resonance biosensors, J. Immun. Meth, 220, 121-133, 1997; Krone *et al.*, BIA/MS: Interacting biomolecular interaction analysis with mass spectrometry, Anal. Chem. 244, 124-132, 1997; and Wong *et al.*, Validation parameters for a novel biosensor assay which simultaneously measures serum concentrations of a humanized monoclonal antibody and detects induced antibodies, J. Immun. Meth, 209, 1-15, 1997.)

Using the catalog of the present invention, one skilled in the art can predict with the tested compound is a carcinogen. Compounds that results in the

production of nucleic acids, peptides or protein from the catalog, or a subset of catalog, are carcinogenic. To be able to predict carcinogenic, one need not use all of the nucleic acids or peptides of the present invention. For example, if one tested for all of the disclosed biomarkers and found 20% or more to be differentially expressed this would predict that the test compound is a carcinogen. Alternatively, one could use a sub-set of the biomarkers, such as, for example, 20-30 of the nucleic acids. With such a sub-set one would expect 70-80% to be differentially expressed when the test compound is a carcinogen. In addition, one could select only a few of the biomarkers, for example, 10, and look for 100% of them to be differentially expressed as an indication of a carcinogen.

mRNA, protein, or genomic DNA of the invention can be detected in biological samples including, for example, tissues, cells, or biological fluids from a subject such as blood, urine, or liver and thyroid tissue.

Various microarrays, beads, glass or nylon slides, membranes or other repeatable assay apparati can be constructed using the nucleic acids, peptides, and proteins of the present invention. These apparati can then be used to detect differential expression of these biomarkers. A non-limiting description of selected methods follows.

A. Microarrays

In one embodiment, the nucleic acids of the invention can be used to monitor expression. A microarray-based method for high-throughput monitoring of gene expression may be utilized to measure carcinogenesis biomarker hybridization targets. This 'chip'-based approach involves using microarrays of nucleic acids as specific hybridization targets to quantitatively measure expression of the corresponding genes (Schena *et al.*, *Science 270*:467-470 (1995), the entirety of which is herein incorporated by reference; Shalon, Ph.D. Thesis, Stanford University (1996), the entirety of which is herein incorporated by reference). Every

nucleotide in a large sequence can be queried at the same time. Hybridization can also be used to efficiently analyze nucleotide sequences.

Several microarray methods have been described. One method compares the sequences to be analyzed by hybridization to a set of oligonucleotides or cDNA molecules representing all possible subsequences (Bains and Smith, *J. Theor. Biol. 135*:303 (1989), the entirety of which is herein incorporated by reference). A second method hybridizes the sample to an array of oligonucleotide or cDNA probes. An array consisting of oligonucleotides or cDNA molecules complementary to subsequences of a target sequence can be used to determine the identity of a target sequence, measure its amount, and detect differences between the target and a reference sequence. Nucleic acid microarrays may also be screened with protein molecules or fragments thereof to determine nucleic acids that specifically bind protein molecules or fragments thereof.

The microarray approach may also be used with polypeptide targets (*see*, U.S. Patent Nos. 5,800,992, 5,445,934; 5,143,854, 5,079,600, 4,923,901, all of which are herein incorporated by reference in their entirety). Essentially, polypeptides are synthesized on a substrate (microarray) and these polypeptides can be screened with either protein molecules or fragments thereof or nucleic acid molecules in order to screen for either protein molecules or fragments thereof or nucleic acid molecules that specifically bind the target polypeptides (Fodor *et al*., *Science 251*:767-773 (1991), the entirety of which is herein incorporated by reference).

B. Hybridization Assays

Oligonucleotide probes, whose sequences are complementary to that of a portion of the nucleic acids of the invention, such as SEQ NO.:1-580, can be constructed. These probes are then incubated with cell extracts of a patient under conditions sufficient to permit nucleic acid hybridization. The detection of double-

stranded probe-mRNA hybrid molecules is indicative of biomarkers of carcinogenesis or sequences derived from rat liver hepatocytes treated with a nongenotoxic carcinogen. Thus, such probes may be used to ascertain the level and extent of carcinogenesis or the production of certain proteins. The nucleic acid hybridization may be conducted under quantitative conditions or as a qualitative assay.

C. PCR Assays

A nucleic acid of the invention, such as one of SEQ NO.:1-580 or complements thereof, can be analyzed for use as a PCR probe. A search of databases indicates the presence of regions within that nucleic acid that have high and low regions of identity to other sequences in the database. Ideally, a PCR probe will have high identity with only the sequence from which it is derived. In that way, only the desired sequence is amplified. Computer generated searches using programs such as MIT Primer3 (Rozen and Skaletsky (1996, 1997, 1998)), or GeneUp (Pesole, *et al.*, *BioTechniques* *25*:112-123 (1998)), for example, can be used to identify potential PCR primers.

The PCR probes or primers can be used in methods such as described in Krzesicki, *et al.*, *Am. J. Respir. Cell Mol. Biol.* *16*:693-701 (1997) (incorporated by reference in its entirety) to identify or detect sequences expressed in carcinogenesis.

These detailed descriptions are presented for illustrative purposes only and are not intended as a restriction on the scope of the invention. Rather, they are merely some of the embodiments that one skilled in the art would understand from the entire contents of this disclosure. All parts are by weight and temperatures are in Degrees centigrade unless otherwise indicated.

EXAMPLES

The following examples will illustrate the invention in greater detail, although it will be understood that the invention is not limited to these specific examples. Various other examples will be apparent to the person skilled in the art after reading the present disclosure without departing from the spirit and scope of the invention. It is intended that all such other examples be included within the scope of the appended claims.

Example 1

Rats were treated with phenobarbital for thirteen weeks or in a separate experiment, for 5 days. Liver mRNAs were extracted and probed for those mRNAs specifically altered by phenobarbital treatment by comparing with mRNA expression in untreated rats. The relative abundance of cellular mRNAs in rat liver was determined using PE GenScope's AFLP (Amplified Fragment Length Polymorphism)-based Transcript Imaging technology. The mRNA is converted into double-stranded cDNA, which is then cut with restriction enzymes. The resulting restriction fragments are tagged with specific adapters of known sequences, which allows for subsequent amplification of the fragments under highly stringent conditions. Similar technology has been used in plants (Money, T. et al., Nucleic Acids Res. 24:2616-2617 (1996), incorporated by reference in its entirety).

Specifically, rats were treated by oral gavage for 88 days in the 13 week experiment, or for 5 days with 200 mg/kg phenobarbital or control vehicle. The average expression levels of mRNAs for three phenobarbital-induced genes (P450 2B1, P450 3A1, and UDP-glucuronosyl transferase) were measured using RT-PCR, and showed substantial induction of mRNA expression levels as compared to control rats.

In one study, ten differentially expressed transcript derived fragments (TDF's) were isolated and cloned. For each TDF, four or five colonies were picked

and their sequences determined using standard sequencing techniques. In each case, all colonies sequenced contained the same sequences. This is a reflection of the ability to reduce the complexity of the AFLP gel profile by using primers with additional selective nucleotides. The ten TDF sequences were BLASTed against GenBank. The identities of the bands were consistent with what one might predict would be altered by treatment with phenobarbital. PCR analysis of the samples confirmed that these genes are differentially expressed following treatment.

Example 2

Validation of AFLP Biomarkers by rt-PCR (Taqman)

After AFLP experiments were conducted, and results analyzed, the effects of phenobarbital on the expression of several biomarkers were validated. RNA was extracted from the same liver samples used in the AFLP study, in addition to liver samples from rats treated with phenobarbital for 2-weeks, followed by reverse transcription reactions to generate cDNA, followed by PCR, using Taqman technology. The genes analyzed for phenobarbital-induced alterations, and the corresponding AFLP sequence numbers are listed in Table 5, and a graph and a chart of the actual results are in Table 6 and Figure 1.

The results indicate that AFLP technology can find biomarkers. Eleven of the 17 (65%) genes analyzed were also determined to be differentially expressed using rt-PCR. However, this is based on comparisons at the same timepoint (13 weeks). When the rt-PCR analyses performed on the 2 week samples are considered, another marker (S-033) is found to be differentially expressed. Theoretically, differences in sensitivity and/or specificity between the two techniques could be accounted for these minor discrepancies. However, S-033 is an example of how AFLP has identified biomarkers which are optimal for carcinogen detection at timepoints other than 13 weeks.

As noted above, the specific examples should not be interpreted as a limitation to the scope of the invention. Instead, they are merely exemplary embodiments one skilled in the art would understand from the entire disclosure of this invention.

TABLE 1

SEQ NO	Annotation*
275	rat mRNA for (S)-2-hydroxy acid oxidase
276	human NADH-ubiquinone oxidoreductase
277	rat mRNA organic anion transporter 3
278	Ula-1 RNA from transformed mouse cell line
279	rat hemoglobin alpha chain gene
280	rat mRNA for calcium binding protein
281	rat heat shock protein 27
282	rat mRNA for 50-kDa bone sialic acid
283	rat mRNA for lactate dehydrogenase
284	rat ribonuclease 4 mRNA
285	mouse Src-associated adaptor protein
286	rat mRNA for plasminogen protein
287	rat gene 33 DNA
288	rat mRNA for 50-kDa bone sialic acid
289	mouse glycolate oxidase mRNA
290	rat mRNA for cytochrome b5
291	mouse mRNA for tripeptidyl peptidase II
292	human eukaryotic protein synthesis init.
293	rat fatty liver acid binding protein
294	rat mRNA for ATP-stimulated glucocorticoid receptor translocation promoter
295	mouse apolipoprotein A-I/CIII mRNA
296	rat fibronectin (cell-, heparin-, and fibrin-binding domains)
297	rat mRNA encoding liver fatty acid binding
298	rat RoBo-1 mRNA
299	rat mRNA for pre-alpha-inhibitor, heavy chain
300	rat pancreatic secretory trypsin inhibitor
301	rat apolipoprotein A-IV mRNA
302	rat apolipoprotein A-IV mRNA
303	rat lecithin: cholesterol acyltransferase
304	mouse mRNA for very-long-chain acyl-CoA
305	rat Cyp3a locus
306	rat gene for alpha-fibrinogen
307	mouse protein phosphatase-1 binding protein
308	novel human mRNA similar to rat 45 kDa secretory protein
309	
310	rat retinol dehydrogenase type III mRNA
311	rat mRNA for lecithin-cholesterol acyltransferase
312	rat oxidative 17 beta hydroxysteroid dehydrogenase
313	rat hydroxysteroid sulfotransferase mRNA
314	mouse major histocompatibility locus cla
315	mouse ubiquitinating enzyme E2-230 kDA mRNA
316	mouse fatty acid transport protein 5 mRNA
317	rat (TSC-22) mRNA
318	rat SMP30 mRNA for senescence marker protein

TABLE 2

SEQ NO	Annotation
319	rat cytochrome P450
320	rat cytochrome P450b
321	rat cytochrome P450
322	
323	rat cytochrome P450 mRNA, 3' end
324	rat mRNA for carboxylesterase precursor
325	rat cytochrome P450e
326	rat aldehyde dehydrogenase (ALDH) mRNA
327	rat mRNA for carboxylesterase precursor
328	rat aldehyde dehyrdogenase (ALDH) mRNA
329	rat lipoprotein lipase mRNA
330	rat cytochrome P450IIB3
331	rat mRNA for P450IIIA23 protein
332	rat aflatoxin B1 aldehyde reductase
333	rat ,RMA for cytochrome P450 3A
334	rat testosterone 6-beta-hydroxylase (CYP 3A1) mRNA
335	rat mRNA for amyloidogenic glycoprotein
336	rat cytochrome P50 PB1 (PB1 allele) mRNA
337	rat epoxide hydrolase mRNA
338	rat mRNA for P450IIIA23 protein
339	rat CYP 3A1 mRNA
340	rat mRNA for hydroxysteroid sulfotransferase
341	rat mRNA for cytochrome P450
342	rat NADPH-cytochrome P450 reductase mRNA
343	
344	rat liver glutathione-S-transferase Yb-1
345	rat cytochrome P450 processed pseudogene
346	rat mRNA for glutathione S-transferase
347	rat NADPH-cytochrome P450 reductase mRNA
348	rat mRNA for P450IIIA23 protein
349	rat delta-aminolevulinate synthase mRNA
350	rat mRNA for glutathione S-transferase
351	rat mRNA for amyloidogenic glycoprotein
352	human GSTT1 mRNA
353	rat cytochrome P450IIB3
354	rat mRNA for glutathione transferase subunit 8
355	rat cytochrome P450IIB3
356	rat NADPH-cytochrome P450 reductase mRNA
357	rat glutathione S-transferase mRNA
358	rat NADPH-cytochrome P450 oxidoreductase
359	mouse mRNA for glutathione S-transferase
360	glutathione S-transferase
361	rat mRNA for glutathione transferase subunit 8
362	rat NADPH-cytochrome P450 oxidoreductase
363	rat cytochrome P450 PB1 (PB1 allele) mRNA
364	rat cytochrome P450 PB1 (PB1 allele) mRNA

365	glutathione S-transferase Yc1 subunit
366	rat 5-aminolevulinate synthase mRNA
367	rat cytochrome P450f mRNA
368	rat mRNA for polyubiquitin, 5' end
369	M. aureus mRNA for cytochrome P450IIC
370	preprocathepsin B (mouse, B16a melanoma)
371	rat phosphoglucomutase mRNA
372	rat malic enzyme gene, exon 4
373	rat mRNA for gluthathione S-transferase
374	rat cytochrome P450 mRNA
375	rat cytochrome P450 mRNA
376	rat cytochrome P450 mRNA
377	
378	human mitochondrial prostatein C3 subunit homolog
379	rat cytochrome P450 3A9 mRNA
380	rat cytochrome P450-1/PB- (ps) gene, exon
381	rat Hsp70-1 gene
382	rat cytochrome P450 mRNA
383	
384	human mRNA for transcription factor BTF
385	mesocricetus auratus mRNA for carboxylesterase
386	rat aromatic L-amino acid decarboxylase
387	rat mRNA for putative progesterone binding protein
388	rat Y-b3 glutathione S-transferase mRNA
389	rat NADPH-cytochrome P450 reductase mRNA
390	rat cytochrome PB23 mRNA
391	UGT2B4, UDP-glucuronosyltransferase 2B4
392	rat glutathione S-transferase A3 subunit
393	rat mRNA for cytochrome b5
394	rat mRNA for glutathione S-transferase
395	rat cytochrome P450 3A9 mRNA
396	glutathione s-transferase Yc1 subunit
397	bilirubin-specific UDP-glucuronosyltransferase
398	rat cytochrome P450 mRNA
399	rat p450Md mRNA for cytochrome P450
400	mouse glutathione S-transferase class mu
401	
402	
403	rat mRNA for beta-tubulin T beta15
404	human micosomal glutathione s-transferase
405	rat transketolase mRNA
406	rat cytochrome P450 (female-specific and growth hormone-inducible) mRNA
407	rat cytochrome P450 (female-specific and growth hormone-inducible) mRNA
408	NPT4, sodium phosphate transporter
409	rah- ras-related homolog (mouse, HT4 neuro)
410	human mRNA for 16G2
411	rat mRNA for analicular multidrug resistance
412	rat UDP-glucuronosyltransferase UGT1A7 mRNA

413	human sodium phosphate transporter (NPT4)
414	rat liver apolipoprotein A-I mRNA
415	rat UDP-glucuronosyltransferase mRNA
416	rat apolipoprotein A-I gene
417	mouse gene encoding tetranectin
418	mouse COP9 complex subunit 7a (COPS7a) mRNA

TABLE 3

SEQ NO	Annotation
419	rat mRNA for hydroxysteroid sulfotransferase
420	Zfp-29 gene for zinc finger protein
421	human HFREP-1 mRNA
422	mouse ATP sulfurylase/APS kinase 2
423	
424	mouse secreted apoptosis-related protein
425	human zinc finger gene ZNF2
426	rat angiotensinogen (PAT) gene, exon 2
427	
428	mouse methyltransferase (Cyt19)
429	mouse activin beta-c precursor gene
430	
431	
432	
433	
434	rat mRNA for hepatic lipase
435	
436	human (H326) mRNA
437	human mRNA for KIAA00181 gene
438	
439	mouse mRNA for paladin gene
440	
441	mouse activin beta-c precursor gene
442	rat orphan receptor RLD-1 (rld-1) mRNA
443	mouse oncomodulin gene (exon 1)
444	rat kallistatin mRNA mRNA
445	
446	rat gonadotropin-releasing hormone
447	URP- nuclear calmodulin-binding protein gb113vrtp
448	mouse Jun co-activator Jab1 (Jab 1) mRNA
449	rat zinc finger binding protein mRNA
450	mouse inhibitor of apoptosis protein 2 mRNA
451	
452	rat mRNA for glutathione peroxidase I
453	mouse CRBPI mRNA for cellular retinol
454	mouse wagneri mRNA for heat shock
455	mouse NPC1 (Npc1) mRNA
456	
457	

TABLE 4

SEQ NO	Annotation
458	rat UDP-glucuronosyltransferase-2 (UDPGT)
459	rat ribosomal protein S12 mRNA
460	rat ornithine decarboxylase (ODC) mRNA
461	rat cytokeratin 8 polypeptide mRNA
462	rat mRNA for cathepsin L
463	human rho GDI mRNA
464	rat CLP36 (clp36) mRNA
465	annexin II, 36 kDa calcium-dependent phos.
466	
467	rat ribosomal protein S18 mRNA
468	rat ornithine decarboxylase (ODC) mRNA
469	mouse (C57BL/6) GB-like mRNA
470	cyclic protein-2, cathepsin L proenzyme
471	human p27 mRNA
472	rat c-myc oncogene and flanking regions
473	rat mRNA for canalicular multispecific
474	mouse ctla-2-beta mRNA homolog
475	rat 3-hydroxy-3-methlyglutaryl CoA reductase
476	rat stathmin mRNA
477	rat mRNA for Mx1 protein
478	
479	rat mRNA for protein phosphatase-2A catalytic subunit
480	rat mRNA for Mx2 protein
481	human mRNA for MUF1 protein
482	mouse MA-3 (apoptosis-related gene) mRNA
483	human BRCA2 region, mRNA sequence CG012
484	
485	pre-mtHSP70, 70 kDa heat shock protein
486	
487	house mouse mRNA for MAP kinase, kinase 3B
488	rat mRNA for 14-3-3 protein gamma-subtype, putative protein kinase C
489	human homolog of the Aspergillus nidulans sudD gene product

* ANNOTATIONS REPRESENT THE PREDICTION OF THE BIOLOGICAL FUNCTIONS OF THE SEQUENCES BASED ON SIMILARITY TO KNOWN SEQUENCES.

TABLE 5

SEQ. NO.	Gene
3	Rat P-450
4	Rat aldehyde dehydrogenase
6	Rat UDPGT1.1
10	Rat vitamin D-binding protein
179	Rat UDPGT
25	Rat cytochrome B
114	Rat delta-aminolevulinate synthase
129	Glutathione S-transferase
34	Rat liver catalase
38	Rat alpha-2u globulin
40	Rat NADP-dep.isocitrate dehydrogenase
42	Mouse JAK1 (protein tyrosine kinase)
230	Rat carboxylesterase
46	Rat cathepsin B
52	(s)-2-hydroxy acid oxidase
116	Estrogen sulfotransferase
92	Rat nicotinic receptor alpha 7 subunit

TABLE 6

SEQ NO.	Fold Change		
	2-week	13-week	AFLP
3	1.34	1.85	2.3
4	16.36	12.88	8.2
6	0.93	1.5	4.6
10	0.66	0.79	1.7
179	14.11	9.05	10.5
25	1.85	0.75	4.2
114	1.22	4.03	3.8
129	2.52	4.03	4
34	0.79	0.45	1.6
38	0.35	0.03	0.04
40	0.88	1.14	2.5
42	0.8	0.83	1.9
230	4.24	5.74	1.3
46	0.87	1.41	2.3
52	0.31	0.09	0.3
116	0.81	0.15	0.32
92	0.45	0.72	6.3

TABLE 7

Gene Description	5' Primer Sequence 5' to 3'	3' Primer Sequence 5' to 3'	Taqman Probe Sequence
Rat liver catalase	550	519	490
Rat Carboxylesterase	551	520	491
Rat cathepsin B	552	521	492
canalicular multidrug resistance protein	553	522	493
(s)-2-hydroxy acid oxidase	554	523	494
estrogen sulfotransferase	555	524	495
protective protein (heat shock proetin 90A	556	525	496
Rat hepatic alp-2u globulin	557	526	497
Rat transferrin	558	527	498
Cytocrhome P450	559	528	499
Aldehyde dehydrogenase, rat	560	529	500
3-methylcholanthrene-inducible UDP gluc.trans	561	530	501
rat senescence marker	562	531	502
Vitamin D binding protein. Rat	563	532	503
RB binding protein 2	564	533	
UDP-glucoronosyltransferase 1	565	534	504
mitochondrial gene fragment, Rat	566	535	505
Rat delta-aminolevulinate synthase	567	536	506
human flavoprotein	568	537	507
alpha-2u globulin, Rat	569	538	508
glutathione-S-transferase	570	539	509
rat cytosolic NADP-dependent isocitrate	571	540	510
Protein tyrosine kinase	572	541	511
hepatic steroid hydroxylase	573	542	512
Nicotinic receptor, alpha sub. unit	574	543	513
Alpha B-crystallin, heart	575	544	514
Bos Taurus aldehyde oxidase	576	545	515
lambda-crystallin	577	546	516
Vav2	578	547	517
MDM2	579	548	518
DAD1	580	549	

WE CLAIM:

1. A substantially-purified nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ NO: 1 through SEQ NO: 580 or fragments thereof, substantial homologues thereof, and substantial complements thereof.

2. The nucleic acid molecule according to claim 1, wherein said nucleic acid molecule has a nucleic acid sequence of a fragment of one of SEQ NO: 1 through SEQ NO: 580 or a substantial homologue thereof or a substantial complement thereof and contains at least 40 nucleotides.

3. The nucleic acid molecule according to claim 2, wherein said fragment has at least 60 nucleotides.

4. The nucleic acid molecule according to claim 3, wherein said fragment has at least 100 nucleotides.

5. The nucleic acid molecule according to claim 2, wherein said fragment has a sequence that is identical or complementary to at least 50 contiguous nucleotides in one of SEQ NO: 1 through SEQ NO: 580.

6. The nucleic acid molecule according to claim 1, wherein said substantial homologues share at least 90% sequence identity with at least one of SEQ NO: 1 through SEQ NO: 580.

7. The nucleic acid molecule according to claim 6, wherein said substantial homologues share at least 95% sequence identity with at least one of SEQ NO: 1 through SEQ NO: 580.

8. The nucleic acid molecule according to claim 1, wherein said substantial homologues differ in sequence identity from at least one of SEQ NO: 1 through SEQ NO: 580 by no more than 5 nucleotides.

9. The nucleic acid molecule according to claim 8, wherein said substantial homologues differ in sequence identity from at least one of SEQ NO: 1 through SEQ NO: 580 by no more than 3 nucleotides.

10. The nucleic acid molecule according to claim 1, wherein said substantial complements share at least 90% sequence identity with at least one completely complementary sequence of SEQ NO: 1 through SEQ NO: 580.

11. The nucleic acid molecule according to claim 10, wherein said substantial complements share at least 95% sequence identity with at least one completely complementary sequence of SEQ NO: 1 through SEQ NO: 580.

12. The nucleic acid molecule according to claim 1, wherein said substantial complements differ in sequence identity from at least one completely complementary sequence of SEQ NO: 1 through SEQ NO: 580 by no more than 5 nucleotides.

13. The nucleic acid molecule according to claim 12, wherein said substantial complements differ in sequence identity from at least one completely complementary sequence of SEQ NO: 1 through SEQ NO: 580 by no more than 3 nucleotides.

14. The nucleic acid molecule according to claim 1, wherein said nucleic acid molecule shares between 95% and 100% sequence identity with at least one nucleic acid sequence selected from the group consisting of SEQ NO: 1 through SEQ NO:580 and complements thereof.

15. The nucleic acid molecule according to claim 14, wherein said nucleic acid molecule shares between 98% and 100% sequence identity with at least one nucleic acid sequence selected from the group consisting of SEQ NO: 1 through SEQ NO:580 and complements thereof.

16. The nucleic acid molecule according to claim 1, wherein said nucleic acid molecule is a carcinogenesis biomarker nucleic acid molecule selected from the group consisting of SEQ NO:1 though SEQ NO:580.

17. An amplification primer selected from the group consisting of SEQ NO: 519 though SEQ NO: 580.

18. A detection probe selected from the group consisting of SEQ NO: 490 though SEQ NO: 519.

19. A substantially-purified carcinogenesis biomarker or fragment thereof encoded by a first nucleic acid molecule which substantially hybridizes to a second nucleic acid molecule, said second nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ NO:1 through SEQ NO:580 and complements thereof.

20. The carcinogenesis biomarker or fragment thereof according to claim 19, wherein said nucleic acid sequence is a carcinogenesis biomarker encoded by a first nucleic acid molecule which substantially hybridizes to a second nucleic acid molecule, said second nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ NO:1 through SEQ NO:580 and complements thereof.

21. A substantially-purified polypeptide encoded by SEQ NO: 1 through SEQ NO: 580.

22. A method of measuring the carcinogenicity of a compound comprising:

a) exposing an animal to the compound; and

b) determining the presence or absence of a polypeptide encoded by SEQ NO:1 through SEQ NO:580.

23. A substantially-purified antibody or fragment thereof, said antibody or fragment thereof capable of specifically binding to the carcinogenesis biomarker or fragment thereof of claim 21.

24. A method of claim 22 wherein said carinogenesis measurement is determined using a substantially-purified antibody or fragment thereof, said antibody capable of specifically-binding to a substantially-purified polypeptide encoded by SEQ NO:1 through SEQ NO:580.

25. A method for determining a level or pattern of a carcinogenesis biomarker in a cell comprising:

(A) incubating, under conditions permitting nucleic acid hybridization, a marker nucleic acid molecule, said marker nucleic acid molecule having a nucleic acid sequence selected from the group consisting of SEQ NO:1 through SEQ NO:580 or complements thereof, with a complementary nucleic acid molecule obtained from said cell, wherein nucleic acid hybridization between said marker nucleic acid molecule, and said complementary nucleic acid molecule obtained from said cell permits the detection of said carcinogenesis biomarker;

(B) permitting hybridization between said marker nucleic acid molecule and said complementary nucleic acid molecule obtained from said cell; and

(C) detecting the level or pattern of said complementary nucleic acid, wherein the detection of said complementary nucleic acid is predictive of the level or pattern of said carcinogenesis biomarker.

26. The method of claim 25, wherein said level is predictive of said carcinogenesis biomarker.

27. The method of claim 25, wherein said pattern is predictive of said carcinogenesis biomarker.

28. The method of claim 25, wherein said level or pattern is detected by *in situ* hybridization.

29. A method of isolating a nucleic acid that encodes a carcinogenesis biomarker or fragment thereof comprising:

(A) incubating under conditions permitting nucleic acid hybridization, a first nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ NO:1 through SEQ NO:580 or complements thereof with a complementary second nucleic acid molecule obtained from a cell;

(B) permitting hybridization between said first nucleic acid molecule and said second nucleic acid molecule obtained from said cell; and

(C) isolating said second nucleic acid molecule.

30. A method of isolating a nucleic acid that encodes a carcinogenesis biomarker or fragment thereof comprising:

(A) incubating under conditions permitting nucleic acid hybridization, a first nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of a nucleic acid molecule encoding for a

carcinogenesis biomarker or complement thereof, with a complementary second nucleic acid molecule obtained from a cell;

(B) permitting hybridization between said first nucleic acid molecule and said second nucleic acid molecule obtained from said cell; and

(C) isolating said second nucleic acid molecule.

31. A method for measuring the carcinogenicity of a composition comprising:

(a) culturing a cell line;

(b) exposing said cell line to said composition; and

(c) determining the presence or absence of mRNA which substantially hybridizes to an at least one nucleic acid sequence selected from the group consisting of SEQ NO:1 through SEQ NO:580 and complements thereof.

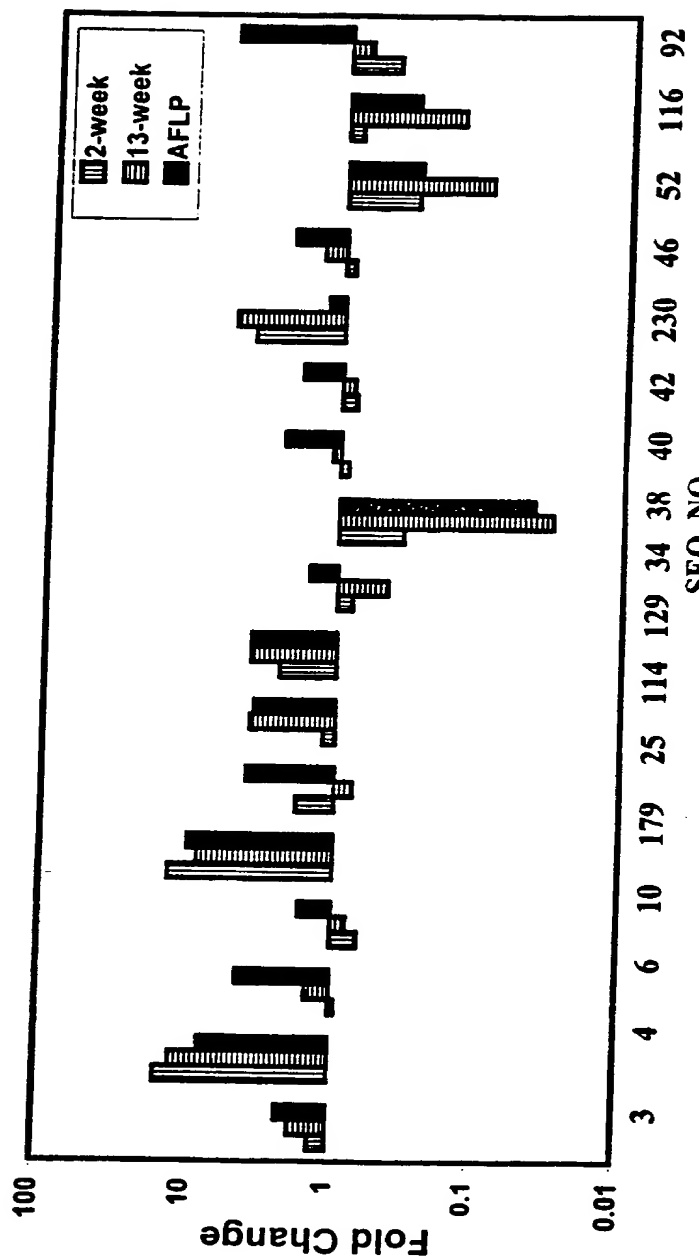
32. A method for measuring the carcinogenicity of a composition comprising:

(a) exposing a cell, tissue sample, or test mammal to said composition; and

(b) determining the presence or absence of mRNA which substantially hybridizes to an at least one nucleic acid sequence selected from the group consisting of SEQ NO:1 through SEQ NO:580 and complements thereof.

33. The method of claim 32, wherein said mammal is a rat.

FIGURE 1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13-week
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gggactgcca gggagaggtc cttagcatac atgaaagtgg acagggacag ctctggggtt
240

taggcaggaa tagacaaagg tgacaagcct cacgacctca gggacaggag tccctgtgag
300

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346

<210> 42
<211> 292
<212> DNA
<213> Rattus norvegicus

<400> 42

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120

tctgccaaag aataagaaca aaatcaacct caaacagcag ctaaaatatg ccatccagat
180

ttgtaagggg atggactatc tgggctctcg gcaatatgtt caccgggact tagcagcaag
240

aaatgtcctt gttgagagtg aacaccaagt gaagatcgga gactttggtt ta
292

<210> 43
<211> 239
<212> DNA
<213> Rattus norvegicus

<400> 43

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acagctaacc aagtattcac gtacccgtga ttctgtgggt tagctaagct cctttgagca
120

gctctactag tgtggcctgg tcctgctcat gagcccagtc acttctcact tcagctgggg
180

ctggttaggc tggggtcacc cagccattgt agcaagtgtt ggttgcatcg gcttggtta
239

<210> 44
<211> 121
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 44

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60

ctttttgcgc cgttcttcct tcacttggca gaagaagtgt gccagcacat cccctacgtt
120

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121

<210> 45
<211> 117
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 45

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60

caggccagtg ccattattta ggcttgcagt ggcgggatta cttcaagcag tggatta
117

<210> 46
<211> 105
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 46

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60

gcccatgaca agccttcctt tcaccactgt cggacgacat gatta
105

<210> 47
<211> 52

<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 47

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52

<210> 48
<211> 442
<212> DNA
<213> Rattus norvegicus

<400> 48

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60

gtcatcacca tcgctcacag gctgcacacc atcatggaca gtgacaagat aatggtccta
120

gacaacggga agattgtcga gtatggcagt cctgaagaac tgctgtccaa cagaggttcc
180

ttctatctga tggccaagga agccggcatt gaaaatgtga atcacacaga agctctagca
240

gctggttccg tggctggcgg gactataaga acagtttcta ttatttgctt tgggtttctg
300

tgactgtgct ctaggtgcaa agacacatat tttgttcccg ttgctcaggc tgggcctcaa
360

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420

gattatcatg aataaatatt ta
442

<210> 49
<211> 227
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 49

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60

gagtgtggcc cgccgggtcc tccaagccct gganggcctg aaaatggtgg aaaaggacca
120

agatggggcc gcaagctaac acctcaggga cagagagatc tggacaggat cgccggacag
180

gtggcatgct gccaacaaga agcattagaa caaaggatgc tgggtta
227

<210> 50
<211> 248
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 50

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acggacacaa gaggaatatc ccctggaagt gaaccaagtg gaaagaatga gctgtgagac
120

tggatagtta tggtgcctca agctgatcct tctgagtggg cggggctagc accccagtgt
180

ccatcaagca aggtctatcc ttctgagtgg gcaggctagc actccagtgt ccagnnattc
240

cagtctta
248

<210> 51
<211> 113
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 51

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60

acatcggaaa gtactttggg aggntgttgg agtatttnnt gattcaagcc tta
113

<210> 52
<211> 198
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 52

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60

atcatacctа gtagtttgag ccctctacct tgagaaatcc agatggatga agaaaagata
120

gctaacagct accagagggt gcatttggat gaaggaataa catctaatgt tntacaggat
180

aacnntaact gacaatta
198

<210> 53
<211> 166
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 53

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60

aggcaacacc tccttcagtc tggagnnaac tctaaatagt gtgaccatgt aggacagagt
120

aaagggcagg gagtgaatta gagaagagtt ggnngtctgg ggatta
166

<210> 54
<211> 190
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 54

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60

atggggattg gtttttcgat tgtcgtggcc tctgacaaaa gagaaaagat agaagagaac
120

ggcagcatga gagtttttgt gcagcacatc gatgtcttgg agaattcctt aggctncnag
180

ttccgtatta
190

<210> 55
<211> 178
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 55

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cagtgctgtg acgtnacttc taatagacga naattagana cagcctgctt gcccataaca
120

ggaaagtgat cactgagatg atagcgtgtc catttgatgg gccncctcag caacgtta
178

<210> 56
<211> 240
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 56

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60

gctcaacaac tacagaacgc acctcccggt ctctctgctc taagatgcta aatatgaaag
120

ccagngtttc acagcccaga tcatccacng cactgcttta ctgattcgga agtttctctt
180

gaggatactc cagatacacc tgagacatta tanatcatat atcaannngc acaaatatta
240

<210> 57
<211> 222
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 57

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60

taccagtgct gctgtaactg aagaaatgcc accccctggaa ggagatgatg acacatcacg
120

catggaagaa gtagactagg cttcaccagn actatgtgtt tgatgcttac cttcattcct
180

tctgatnata tattttccat gattttngnt ttatttttgt ta
222

<210> 58
<211> 112
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 58

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60

tcatatnaca atttatgntc ccttgtgtca ttgtgnnccc attcctgagt ta
112

<210> 59
<211> 176
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 59

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60

gaagaaagct agnacaaatg cagaagaaag atgtctgatc tgcccttcat gttgngagtt
120

tgtgagtgtg tgcatgangc ctctgttcag atcntgtgct nnngtttagc cattta
176

<210> 60
<211> 91
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 60

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60

ggtgacacgg ggcttggnnn acacaacctt a
91

<210> 61
<211> 332
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 61

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60

aacactctat cacatcacan tgtggacatt cctccttgcc ctgggacact tcntctcgga
120

gttgtttgta tttggnacag cggctcccac agttggtgtg ctggcaccct tgatggtagc
180

aagtttctca atcctgggta tgctagttgg gctccggtac ctanaagcag aaccagtatc
240

cagacagaag naaagaaatt gaggccancc ttgncagctc tgatacatca tggtnttcca
300

cctttgctct ntttanncac tctctgtcct ta
332

<210> 62
<211> 274
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 62

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60

acaatatcat tgatctaacc aagactgatc gctgtctcca ggcccgagga tgaagaaagg
120

cctgagcctc cagtggnnnn nnnnnnnnnn nncaccagga ctctagcatc accatttcct
180

gtccatggag catcctgaga caaattctgc gatctgatgt ccatcctctg tcacagaaaa
240

gtgcaatcct gtctctccag ctcttcccta atta
274

<210> 63
<211> 70
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 63

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60

tatctgctta
70

<210> 64
<211> 280
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 64

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ggccacttac tataggtnat aaggtcactg tgnccctcag caggnccaag cactgcatgt
120

agggaaggaa gggtccagga gctgtccaga gcgccattta gctctccttc tgtttaggaa
180

ataaagacag agtgtgcaaa gagaggcagt cagcactccc tcntgctcag ggaaccctgg
240

acagctgtgg acaggcatgg ggtannncta ctcttcatta
280

<210> 65
<211> 202
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 65

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60

agacagacag gccatcagtg tggaatgtcc gagaaggcga ttgaaaagtt tatcagacag
120

ctactcgaaa agaatgactc aaagggacca ccccagtacc ctctccttat agccatgtat
180

aagtcnnctn actctgggat ta
202

<210> 66
<211> 162
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 66

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60

ggccaatgac accacgttng gactagcagc tggggtcttt accaggacat tcagaggcgc
120

acaggtggcg gctgagctnc aggccgcnaa cgtgctacat ta
162

<210> 67
<211> 57
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 67

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57

<210> 68
<211> 131
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 68

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60

tgtagtaaan agagaatgtc ttagtgtggt tgtgagtgac agtgaaattc aatgncnnta
120

aaaggacatt a
131

<210> 69
<211> 77
<212> DNA
<213> Rattus norvegicus

<400> 69

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60

gagaagacac ctgttta
77

<210> 70
<211> 353
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 70

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60

acactttgga actggtggtg tagccctcag tatcatcttg aacaccagtt ggggctcctg
120

cagtgccctt tgtgcttcac tgggttttgg acgaagcagt gaggcccctg cttcctgtca
180

tgtagtgact gtagtgtgct gcgtgactat ctcggtcaag tcccgtcaag aagatgaaag
240

tccacagcaa aaggcangtt cgattcccag tgcctgctca cagctgcctg tatcttgatc
300

tgcaggggac cctgtgcctc tggtttctgt ggatacaaat gtgtatgccc tta
353

<210> 71
<211> 187
<212> DNA
<213> Rattus norvegicus

<400> 71

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60

gctctctaat caccacgacc atcacgatga attctgcctt atgccttgac ttcggtcatt
120

tcccctgaga ttcatactgt gattcccgct gtattcctag cccttgcatt ttcctgacat
180

gcctttta
187

<210> 72
<211> 116
<212> DNA
<213> Rattus norvegicus

<400> 72

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60

atctgagccc caatgctctc tacacaccag aattctatct tttagcagtg acttta
116

<210> 73
<211> 147
<212> DNA
<213> Rattus norvegicus

<400> 73

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60

gttattagca gaatgaagga tggcctcaaa cgaagaaaga tgcatcaccc tcgaggctct
120

tcagaatgct ggatagaggc ttactta
147

<210> 74
<211> 195
<212> DNA
<213> Rattus norvegicus

<400> 74

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60

cccctgtgga gagggagaaa gaaaggggag ccgctgacct gcagggatac agaccttccc
120

cacagcctgg cagccgcccg tttgttgcag cttattatca gactgtgggc tatcatagtt
180

catgctcgtt tctta
195

<210> 75
<211> 100
<212> DNA
<213> Rattus norvegicus

<400> 75

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60

ttgaacaact tattttcctt gtatcgatag agggtgctta
100

<210> 76
<211> 395
<212> DNA
<213> Rattus norvegicus

<400> 76

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60

ctgcctggtc tgtctcatcc tgtcttctga gagcgtggtt cacagacctt gtgtctgagt
120

gaagggaacc caggttcaga ttccgtttct ctgcttctgt ctttttctca gcagcagggt
180

aggaacaggc cttttgtgca catacaacag atgaagccca tgatgagtct gtgggaaaca
240

ccaacactca tgcaccctgt gggtgaccct ccctacacag cgcagagcag agagagcccg
300

ggaggtgctg caggcttcac tgagctttcc ttgcccagac tggcaaccga ctttgctctc
360

ttttgaaaga ctctagctaa agtcagcgtt gttta
395

<210> 77
<211> 56
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 77

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56

<210> 78
<211> 164
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 78

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60

gccttacaac atcgctcaca tggaggccaa gggagcagcc gtgaaagtcg ccatcaacac
120

gatgaccagc gcagatttgc tcagtgcctt gagagcggtc atta
164

<210> 79
<211> 207
<212> DNA
<213> Rattus norvegicus

<400> 79

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60

tggggccttt gggctgccca ccactgttgc ccacgtggat ggtaaaacct acatgctatt
120

tgggtctgac cgcatggagt tgctagctta cctgctagga gagaagtgga tgggccctgt
180

gcccccaacc ctgaatgcca gacttta
207

<210> 80
<211> 112
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 80

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60

atgacacatc ccgggagttg ccacactagc aagagcctgg ctgnttcctt ta
112

<210> 81
<211> 183
<212> DNA
<213> Rattus norvegicus

<400> 81

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60

gcacaattcc tgtgtgagtt ggaatgatgt atttgcttac caaagctcaa gatcatccac
120

aggacaacca cagagtccac atcaaaggag agaggtggtc tttgttgatc cagactggcc
180

tta
183

<210> 82
<211> 118
<212> DNA
<213> Rattus norvegicus

<400> 82

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60

ttgtctgacc tccatgggag attttgtttc tggctaaaat aaaggctaaa taagctta
118

<210> 83
<211> 264
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 83

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tgtggttaga tggggacagg agtttttctc ccttgccttt ctggggatgg agaagggcta 120

aaccaagncc atgttgtctg gagaggtgca cccaggggtg aaggggtctg agaggccttc 180

cacctacccct cagagagcct gggttcctca ggggctcagt ggggcagcac tttttgttat 240

tgtcgtgata agttcgtagc atta 264

<210> 84
<211> 60
<212> DNA
<213> Rattus norvegicus

<400> 84

gatctcccag gactcaagac accagttggc agaggaagag cctggcttcg gttggcatta 60

<210> 85
<211> 136
<212> DNA
<213> Rattus norvegicus

<400> 85

gatcttggtg agtgtcacct tttttatttt tttgtttttc gagacagggt ttcttctgta 60

tagccctggc tgtcttggaa ctctgtagac tgggctggct tctgactcag agctctgcct 120

gcctctgctg ggatta 136

<210> 86
<211> 85
<212> DNA

<213> Rattus norvegicus

<400> 86

gatccaaggt atgaagacgc agagtaaacc ctcagttatc aaacggaaaa agatgggcag 60

ctaagatgca tataaagggg agcta 85

<210> 87
<211> 145
<212> DNA
<213> Rattus norvegicus

<400> 87

gatccaaaga tttctaactt ggctcccttg ggcattcctc gaaggattat caagaacaca 60

accttccgtg gcttcttcct ccccaagggc accgatgtgt tccctatatt aggttctctg 120

atgacagacc caaagttctt cccta 145

<210> 88
<211> 346
<212> DNA
<213> Rattus norvegicus

<400> 88

gatccagtaa attctcttca attccctgta gatttactaa gtgaccaccc atttcctgcc 60

ctcactaagt gacaatacct tccctgcaga cccactaata cacgcttcct tcatatccta 120

ctcaggaagt gaccatgtca actgagccct tctgactgac tgtccgactg tccttgtcaa 180

ttgccactct catgtcccct ccctctctca ctgccacact cctccatcag catgtagaga 240

gtgtcttttt caactttggt ctttcctttt gtggacaaca tttctgcaaa agagcaaggg 300

tctggaactt gccctggcct ctgacccctg gatgtgtgtg ctgcta 346

<210> 89
<211> 205
<212> DNA

<213> Rattus norvegicus

<400> 89

gatccagagt tcaaggtcag ccttggatac atatgcagtt ccagaccaac ctgggatata 60

ggagacccca tctcaaaaaa acaaaccaac cctgccctcc agtaaccgtc caggagagtg 120

tggtggtgca ggctgagccg ctctataccc agcctctgag aactttgtcc tctcggcaac 180

ttgatagcct gcggttggtt ggcta 205

<210> 90
<211> 211
<212> DNA
<213> Rattus norvegicus

<400> 90

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acctgtatca gagagaattc tggggggctt cgaggcaccc tacactccat gctccagttt 120

tcagccgccc ccacctcacc cccatctctt tagtcttacc tgaggttggt tgacagcctg 180

cctatgtttt ctctgttgtc ttcctaccct a 211

<210> 91
<211> 166
<212> DNA
<213> Rattus norvegicus

<400> 91

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ccgttggcgt gtaggtatcg gattagtcag ccgtagttta cgtctcggca gatgtgggtg 120

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<210> 92
<211> 148
<212> DNA

<213> Rattus norvegicus

<223> unsure at all n locations
<400> 92

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60

tgaggtttcc tcattgcatg cgatagggtg atcatgattt ccccactaac tcattttctg
120

gctggcctct tttatanagc tcgcccta
148

<210> 93
<211> 52
<212> DNA
<213> Rattus norvegicus

<400> 93

gatccatgga ggtggactaa taatagcgga gcatcaccct atagtgtgac ta
52

<210> 94
<211> 43
<212> DNA
<213> Rattus norvegicus

<400> 94

gatccatttc tttagcagtt gaaacagctg gccattgtaa cta
43

<210> 95
<211> 228
<212> DNA
<213> Rattus norvegicus

<400> 95

gatcccagcc gtcgtggatc ctctcaccat tacttcttcc ctgtcatcgg atggagtcct
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cactgtgaat ggaccaagga aacaggcctc tggccctgag cgcaccattc ccatcacccg
120

tgaagagaag cctgctgtca ctgcagcccc taagaagtag attccctttc ctcgttgcat
180

tttttaagac aaggaagttt cccatcagcg aatgaacatc tgtgacta
228

<210> 96
<211> 103
<212> DNA
<213> Rattus norvegicus

<400> 96

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ccagtgtggt tcttgctggg cttttagcgc atcgggttgc cta 103

<210> 97
<211> 343
<212> DNA
<213> Rattus norvegicus

<400> 97

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ccccttgcct tgaaagccct tctaagctcg gcctgagaac tcctcctcac ccttcaccct 120

tcccagccca aggctccgag ggtcccatca gtgctgatga gtctggcctt tgagcttttc 180

ttgacaattc ctaatggttc taaagcctgg agcccccgga aactgtgagc taaggagaca 240

tagcacaaaa tcataaatga gttgcgggga gaggctggaa acagtgtgca agaaatacag 300

gccaggggtt ggggatttag ctcagcggta gagcgcttgc cta 343

<210> 98
<211> 50
<212> DNA
<213> Rattus norvegicus

<400> 98

gatccccatt agcttgtgcc tgtggccaga aaaggccaaa gccagcccta 50

<210> 99
<211> 48
<212> DNA
<213> Rattus norvegicus

<400> 99

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48

<210> 100
<211> 72
<212> DNA
<213> Rattus norvegicus

<400> 100

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60

cgatcatacc ta
72

<210> 101
<211> 200
<212> DNA
<213> Rattus norvegicus

<400> 101

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acactcaaac accctgtatt catctaaggg tctgggagag tctggggtgt tcctgggctg
120

ttcggtattt tttgccatcc atgacgcagt gagggcagcg cggcaggaga gaggcatctc
180

tggaccatgg aagctcacta
200

<210> 102
<211> 143
<212> DNA
<213> Rattus norvegicus

<400> 102

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ctgttttgag aactccggat actactttga ctctggcttg gggcgaagga agtgcacccc
120

agatcaaaag caacacattt cta
143

<210> 103

<211> 343
<212> DNA
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<400> 103

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cttacaatcc tgcaaggatt ccacccaagt cagcagcagt cacgggcctc cttcactgat
120

gtgtgttctg cctgctcagc ccctgccaca gaggcctgga ggtgtgggag tgtggcctaa
180

gcacagtctg ccatccttga ccgcagacct cttggaccca cccccactcc ctccagacac
240

tggtaagaga agccttcctg caacatgtcc tgtcctcagg aggtgagaca gcagagtgct
300

tccattcact cgatgacccc atttttgctc ttcctttggg cta
343

<210> 104
<211> 41
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 104

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41

<210> 105
<211> 67
<212> DNA
<213> Rattus norvegicus

<400> 105

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60

tgctcta
67

<210> 106
<211> 192
<212> DNA
<213> Rattus norvegicus

<400> 106

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taatgccctg cactgacaca ttaaagcctt ggtacaggcc cttaatccca tcagatttgt
120

agatcttaac caggcagtca ccaaggcctt tgaattccct ttcagctcca gctttgccca
180

catcagctgc ta
192

<210> 107
<211> 97
<212> DNA
<213> Rattus norvegicus

<400> 107

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60

gaggctctcc cgagactccc tgtactcacc cctgcta
97

<210> 108
<211> 42
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 108

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<210> 109
<211> 67
<212> DNA
<213> Rattus norvegicus

<400> 109

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60

ttgccta
67

<210> 110
<211> 207
<212> DNA

<213> Rattus norvegicus

<400> 110

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ggtagtgggc gaacctggag tcacagtcac tcgcctggcg gtcagccaag taccacgaag 120

tgggaagcca gctgagctgc tgaagatgtt tggtattgac aaagacgcca ttgtgcaagc 180

tgtgaagggc cttgtcacca agggcta 207

<210> 111
<211> 271
<212> DNA
<213> Rattus norvegicus

<400> 111

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ttcacaatct ttccctgtga tgaattagca tctccagctc tctgcctata tagtagatat 120

ggaccacaaa gaagtaaata atggtgtgca atttttgtca aggaatcttt agaggcccac 180

acaattccaa attctcactt catgtcagag attgaatgat tgaaaagctt tctgcagtaa 240

attatttacc ctattttctt agcatgtact a 271

<210> 112
<211> 415
<212> DNA
<213> Rattus norvegicus

<400> 112

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cggctctcct cttgggaaag acctgctgtt taaggattct gcctttgggc tgttacgggt 120

gcccccaagg atggactaca ggctgtacct cggccacagc tatgtcactg ccattcgaaa 180

tcagcgggaa ggcgtgtgcc cggagggctc catcgacagc gcgccagtga aatggtgtgc 240

actgagtcac caagagagag ccaagtgtga tgagtggagc gtcagcagca atgggcagat 300

agagtgtgag tcagcagaga gcactgagga ctgcattgac aagattgtga atggagaagc 360

agatgccatg agcttggatg gaggtcatgc ctacatagca ggccagtgtg gacta 415

<210> 113
<211> 152
<212> DNA
<213> Rattus norvegicus

<400> 113

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gtgctgggtg taagaccaca ccctccagag ggaagaaagg ctcctctctg ggttgtgcgc 120

tgactttctt atactgctcc cttgtgccac ta 152

<210> 114
<211> 295
<212> DNA
<213> Rattus norvegicus

<400> 114

gatcctgaag agcaatgagg gacgtgccct ttcgccgcca gcaccagcgc aatgtcaagc 60

ttatgaggca gatgctaatg gacgctggcc ccccagtcat ccactgcccc agccacatca 120

tccctgtgcg ggttgcctga tgctgctaaa aacacagaaa tctgtgatga agttgatgac 180

caggcataat atctacgtcc aggccattaa ttacccaaca gtgcctcgtg gggaggagct 240

cctccggatc gcccccaccc cgcaccacac accgcagatg atgaacttct tccta 295

<210> 115
<211> 76
<212> DNA
<213> Rattus norvegicus

<400> 115

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60

ccaagctgat ttgcta
76

<210> 116
<211> 290
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 116

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60

cctgaagccc tgagggagag atttgaggag cactaccagc ggcatatgaa ggactgccct
120

gtgaagttta gagcagagct ctgagacact tccttgtgtc tgaaattgga gtagtctcca
180

atttatcctt cagtttttct tgttttgaat tcagtagaag tagaagtctt ttgaagactg
240

atggtttaaa ttcattctgg ttttttaaac naacntttat tttaatctac
290

<210> 117
<211> 228
<212> DNA
<213> Rattus norvegicus

<400> 117

gatctaacca agactgatcg ctgtctccag gcccgaggat gaagaaaggc ctgagcctcc
60

agtgctgagt ggagacttct caccaggact ccagcatcac catttcctgt ccatggagca
120

tcctgagaca aattctgcga tctgatttcc atcctctctc acagaaaagt gcaatcccgg
180

tctctccagc atcttcccta gttacccagg acaacacatc gagaatta
228

<210> 118
<211> 93
<212> DNA

<213> Rattus norvegicus

<400> 118

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60

cacagttagt cactttgtgt cacccggaat cta
93

<210> 119
<211> 145
<212> DNA
<213> Rattus norvegicus

<400> 119

gatctacacc acagtttcta acagtagcaa cattacagcc atgaagtagc agtgaaaata
60

acttgatggt gggggaatc accagaatat gaggaactgt attaaagggt cgcagcattc
120

ggaaggttga gaagccactg ggcta
145

<210> 120
<211> 34
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 120

gatctacatt ggaaggcgtn gacaactanc acta
34

<210> 121
<211> 45
<212> DNA
<213> Rattus norvegicus

<400> 121

gatctaggcc cctttcctcc tctaaccttc tttctctcct gccta
45

<210> 122
<211> 363
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations

<400> 122

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ctgatgaagt accncacatg tcacagctaa agtccaggaa gagattgacc gtgtgattgg 120

cagacatcgc agcccctgca tgcaggatag aaaacacatg ccctacacag atgccatgat 180

tcatgaggta ncagagattc attaactttg tcccgaccaa cctgccccat gcagtgacct 240

gtgacattaa attcaggaac tacctcatcc cgaagggaac aaaagtgtta acatcactga 300

catcagtgct gcatgacagc aaggagttcc ccancccana gatgtttgcc cnanccactt 360

cta 363

<210> 123
<211> 132
<212> DNA
<213> Rattus norvegicus

<400> 123

gatctcaggg gaggtatgct taaggccaga gctcttcctc agtatttgat ttttccagtg 60

tttgtttttt taaaaactga caggtgctac atttctatct gttggtttca attctgccat 120

atttcatgtc ta 132

<210> 124
<211> 89
<212> DNA
<213> Rattus norvegicus

<400> 124

gatctcagca gcctggttgt cacagtagaa taagaatggc tggccttaac cttccctgtg 60

agtgacgtga atgaatgcct acctggcta 89

<210> 125
<211> 206

<212> DNA
<213> Rattus norvegicus

<400> 125

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tcggttcctg ccgatcacct gctcaatttc ctcatggacc ttggcctcca catctggatg
120

cttcatgagt agaaggaagc cgtagcgtag tgtggagctg actgtctcag acccagcaaa
180

gaagaggctt agtgttgtca tcacta
206

<210> 126
<211> 71
<212> DNA
<213> Rattus norvegicus

<400> 126

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60

gatccgggct a
71

<210> 127
<211> 129
<212> DNA
<213> Rattus norvegicus

<400> 127

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60

tttaacgtgt ggcctccagg tgctttctta ctgtttgcca aaattgagct gcctcaagac
120

aaggtacta
129

<210> 128
<211> 247
<212> DNA
<213> Rattus norvegicus

<400> 128

gatctctccc gagagacaca gccagaatac agcaaataca taggcaaatg ccagcagcaa
60

accaccgaac tgaaaacggg acccccgttt aaggaatcag agaaaggact ggaagagctt
120

gaaggggctt gagaccccat atgaacaatg ccaagcaacc agagcttcca gaaactaagc
180

cactacccaa agactgtaaa tggactgacc ctgggctcca acctcatagg tagcaatgaa
240

tagccta
247

<210> 129
<211> 347
<212> DNA
<213> Rattus norvegicus

<400> 129

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60

ccaatggagt aacaagtagg cccttgctac actgggcact cacagagagg acctgtccac
120

attggatcct gcaggcaccc tggccttctg cactgtggtt ctctctcctt cctgctcccct
180

tctccagctt tgtcagcccc atctcctcaa cctcacccca gtcatgccca catagtcttc
240

attctcccca ctttctttca tagtggtccc cttctttatt gacaccttaa cacaacctca
300

cagtcctttt ctgtgatttg aggtctgccc tgaactcagt ctcccta
347

<210> 130
<211> 431
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 130

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60

accgccttgg caaaagacag gaccaaaaac cggtacttgc ctgcctttga aaaggtgttg
120

aagagccatg gccaagacta ccttgtaggt aacaggctga cccgggtaga catccacctg
180

ctggaacttc tcctctatgt tgaagagttt gatgccagcc ttctgacctc tttccctctg
240

ctgaaggcct tcaagagcag aatcagcagc ctcccccaatg tgaagaagtt cctgcagcct
300

ggcagtcaga gaaagcttcc cgtggatgca aaacaaatcg aagaagcang gaagattttc
360

aagttttagc ggagctgcac tgtccaattt ctttatgctt tgcanaaaat gagaagcaat
420

tgttgatcct a
431

<210> 131
<211> 180
<212> DNA
<213> Rattus norvegicus

<400> 131

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cttgccaaaa tcaaggacaa agcaaggaac cgttactttc ctgcctttga aaaggtgttg
120

aagagccatg gacaagatta tctcgttggc aataggctga gcagggctga tgtttaccta
180

<210> 132
<211> 156
<212> DNA
<213> Rattus norvegicus

<400> 132

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60

gaagaaactg cacaaaccat ctcattcctg tcttatcttt attgtattgg aagctttctt
120

taagttacca tattttagag cgttgttagt gcccta
156

<210> 133
<211> 187
<212> DNA
<213> Rattus norvegicus

<400> 133

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gctctgcaac aatgaagtat tttgactaaa tgttgaccgt acttattggg agggtaacat 120

gttttctaag gcttctgtgt taattcatat agacatgact catgaggaat tgctgggatg 180

ccatcta 187

<210> 134
<211> 295
<212> DNA
<213> Rattus norvegicus

<400> 134

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gttcctgtgg gaaaggtccc agatacacac tccagagcta actctgaaac gtcaagaaat 120

caaagcccag aatctcgtgt aggcgaatgg agactcccca aaggacacga aacagctgtt 180

aaagtagcgg gcagtgtgtc cgagaagctg ccctccagca gcctgctcat ggacagagct 240

gaagcagcca gccttgcaca gtcggcaggc cacgaggact gggaagtggt gtcta 295

<210> 135
<211> 93
<212> DNA
<213> Rattus norvegicus

<400> 135

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tgtccccatc cctcacactt tccctccatg cta 93

<210> 136
<211> 156
<212> DNA
<213> Rattus norvegicus

<400> 136

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60

ttggaaaagt gcagcgaatt ttaacgtatg tgatccgcca tgctgtgaaa acactattgg
120

gatacctccc ctgtgacggt attggaggtt tggcta
156

<210> 137
<211> 73
<212> DNA
<213> Rattus norvegicus

<400> 137

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60

ctgttgtcag cta
73

<210> 138
<211> 137
<212> DNA
<213> Rattus norvegicus

<400> 138

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60

ttagaataag gtgatttttg tttagcccac agactcatgg gagtagatta gtgtaagtta
120

ggatgaactt cacccta
137

<210> 139
<211> 125
<212> DNA
<213> Rattus norvegicus

<400> 139

gatccaggct ccagttgtca tggctgcttt gatgagccct ttcccgaaga cttgcttgag
60

tttgggctgg agttcaaagt tctgcagccc tccgtgcaca gagatgagaa gtttgggaag
120

ctcta
125

<210> 140
<211> 103
<212> DNA
<213> Rattus norvegicus

<400> 140

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60

agccatggag aatgtagtgg tggtcactat ccaataccgc cta
103

<210> 141
<211> 172
<212> DNA
<213> Rattus norvegicus

<400> 141

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60

gaggaaaaga aactggtggt cctgcctttc cctgggaagg aacagcgctc ccctgagtgc
120

ccggggcccg aaaagcaaag aaccccctga tgctccccgc tgagactcac ta
172

<210> 142
<211> 238
<212> DNA
<213> Rattus norvegicus

<400> 142

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60

atgtgtggat gacagcaaag gtcagaagct actgcctgcc cctctggttt agatggttgc
120

tcaggagccc agacttcgac tcatggtgtg ccagggaggg ctggggacaa caggggtcc
180

cttcccaggc ccatctgctg ccccacactg atctgcctgt cttttctgct gctctcta
238

<210> 143
<211> 104

<212> DNA
<213> Rattus norvegicus

<400> 143

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60

ggatgtccct ccgattatgt ccacggggat gccacattct gcta
104

<210> 144
<211> 178
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 144

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60

gtacggcatg cctgtcaccc tcatcggaga agctgtcttt gctcggtgct tgtcttctct
120

gaaggaggag cgagttcagg ccagcagana gctgaagggc cccaagatgg tccagcta
178

<210> 145
<211> 157
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 145

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60

ccgggatcag ctgatagaca tgaagcgcct gnaggtaagc ctgaggcncn ggccccaatt
120

tgtctttgac taagaaaaaa ggaatangaa cactcta
157

<210> 146
<211> 207
<212> DNA
<213> Rattus norvegicus

<400> 146

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60

ctccggtggc tggatcaaca gtcaggttat ccactaaggt gcccagctga attaccttca
120

ctggagttaa atcccaatta ttgtgttttt tcattatgtg aatgttctta gctgttacat
180

cagctacata gacatacttc tggtcta
207

<210> 147
<211> 453
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 147

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60

tcacaaaggc tacgtctccc ttctcaacga ggcactggaa agcccctgta taaccattat
120

atccctctct gttgttcgga gcacattttg ctgggccaat acacaggtca cagagggtgg
180

aattcttctt atagccagga gcacagcctt gactgaaaaa ttcatcgaac ttgcagtggt
240

tgatcctgct gaacagcagg cccataggga tgttccagcc ggcggttctg tctactccag
300

tatggcagga cttcttgcct ttcaggttgt tccagttgat gctggagtct gatgccttca
360

ccacagccac ggcataatac cctttaggaa agacatctga ttgtgggttt gtacacgaag
420

agatatcata gttctctgcc atgacnggca cta
453

<210> 148
<211> 140
<212> DNA
<213> Rattus norvegicus

<400> 148

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60

caagaaatgc ttaatgggtt cctgtattct ttcttcctgg attactcagt gctgagtgga
120

gacttctcac caggactcta
140

<210> 149
<211> 258
<212> DNA
<213> Rattus norvegicus

<400> 149

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60

acagaggagc tgcggtcgcg cctctccaca cacctgcgca agatgcgcaa gcgcctgatg
120

cgggatgcgg atgatctgca gaagcgcctg gcggtgtaca aggccggggc acaggagggc
180

gccgagcgcg gtgtgagtgc tatccgtgag cgcctggggc cactggtgga gcagggtcgt
240

cagcgcacag ccaaccta
258

<210> 150
<211> 98
<212> DNA
<213> Rattus norvegicus

<400> 150

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60

cctaatgaga agggctctgt cagcatggac ctggacta
98

<210> 151
<211> 64
<212> DNA
<213> Rattus norvegicus

<400> 151

gatctagatg acacggagga gccccaggac cttccctgag gtgatttcac ccttggtgcc
60

acta
64

<210> 152
<211> 136

<212> DNA
<213> Rattus norvegicus

<400> 152

gatctccaca tcagtactac aatggctatg agaaaggcct gcaagctttc tccatggaca
60

aacacctggg ccacggcttc gctccgcagg tagatatttt cgatcttttc tggagctatg
120

tactctcctt gggcta
136

<210> 153
<211> 132
<212> DNA
<213> Rattus norvegicus

<400> 153

gatctccgga ggtgcggtgc ctctggttgt aagaccagct ttgaagcact cctacagagc
60

catctgagca gaggggcctg gcactccagg caggcgagcg atgctcaagc ttgttaccag
120

tctggtctcc ta
132

<210> 154
<211> 218
<212> DNA
<213> Rattus norvegicus

<400> 154

gatctccacc gaactggtga agagcaagct cagggagacc actggggcag cctgcaaata
60

tggggtaagc aactacatgt gtattcccag tccctgtcta aagatagaga cgtcatgttg
120

ccatagctgc tcacgctcct gtgagctgcc ttctccccat cctaagtcct cctcagcttt
180

cctaaacacc tcatccactc ccttcctccc taagccta
218

<210> 155
<211> 124
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 155

gatctccatc agaaaccaaa atgatcagag agactgagtc ggggttcagc aatcccatgt
60

tactggcttc gttcagaatg aaaattgctc tcagcagncc tcattgatat ttgtgcctcc
120

acta
124

<210> 156
<211> 218
<212> DNA
<213> Rattus norvegicus

<400> 156

gatctccccc agcagcagct ccaccacaat cagaagcttg tgcaccgtct gtttgaagcc
60

aactgctgtg tgctgtggtg cctttcgaag ggcattggtc atcgttctcc gggcttcaga
120

gtactccagt tggatagcct tgattcgccc tgtgtagtag aggtacctgg cccactcatt
180

gttgttagcc tgttcgggga acacagactt ggacacta
218

<210> 157
<211> 43
<212> DNA
<213> Rattus norvegicus

<400> 157

gatctcattt taacccgtaa ccagtctata tgtgtttgga cta
43

<210> 158
<211> 357
<212> DNA
<213> Rattus norvegicus

<400> 158

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60

gagttcgcca cctgccacct ggcccaagct ccaaaccatg ttgtggtctc acgaaaagag
120

aaggcagccc gggttagcac tgtgctgact gcccagaagg atttattttg gaaaggtgac
180

aaggactgca ctggcaattt ctgtttgttc cggtcttcca ccaaggacct tctgttcaga
240

gatgacacca agtgtttgac taaacttcca gaaggtacca catatgaaga gtacttagga
300

gcagagtact tgcaagctgt tggaaacata aggaagtgtt caacctcacg actccta
357

<210> 159
<211> 47
<212> DNA
<213> Rattus norvegicus

<400> 159

gatcttggcc ttcacgttct cgatggtgtc actgggctcc acctcta
47

<210> 160
<211> 113
<212> DNA
<213> Rattus norvegicus

<400> 160

gatcttatca caccagccag caaagtaccg gaaggtctgg atggacatgc ccacgtgcgt
60

cttcagggcc agcgtgtaga cggcacctgc atccagggcc tcaatggtgg cta
113

<210> 161
<211> 163
<212> DNA
<213> Rattus norvegicus

<400> 161

gatcttggat gatgacaatt ttctgggagc tgagaatgcc tttaacttgt ttgtgtgtca
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gaaggacagt gctgccacca ctgatgagga gcggcagcac ctacaggagg ttggtctctt
120

ccacctgggc gagtttgtca atgtgttctg ccatggctcc cta
163

<210> 162
<211> 180

<212> DNA
<213> Rattus norvegicus

<400> 162

gatcttggtg accatgctac cctgaagagg tccccaggag attgcaagag tgccccaact 60

acagaggaga ctcgcaggct gtctcaggcc atgatggctt ttactactga cctgttctcc 120

ctggtggccc aaacatccac cagctccaac cttgtcctgt cacccttag tgtggcccta 180

<210> 163
<211> 179
<212> DNA
<213> Rattus norvegicus

<400> 163

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ctgaagaaac ttcttcactg tggggaggtt gctgactctg gttctcaggg ccttcagcag 120

agggaagttg gccaaagcgc tggggtccag ctcttccaca tggtagagaa cttgaacta 179

<210> 164
<211> 217
<212> DNA
<213> Rattus norvegicus

<400> 164

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tagtcataag ggaaatgcaa atcaaaacaa ccctgagatt ctacctcaca ccagtcagaa 120

tggctaagat caaaaactca ggtgacagca aatgctggaa aggatgtgga gaaagaggaa 180

cactcctcca tttttggtgg gattacagaa tggttta 217

<210> 165
<211> 197
<212> DNA
<213> Rattus norvegicus

<400> 165

aattcacaga gacggctgcc atatttgaag atggctccag ggaggatgac attgatgtgg 60

tcatctttgc cacaggctac agctttgcct ttccttttct tgaggactct gtcaaagtag 120

tccaaaacaa ggtctccttg tataaaaagg tctttccccc taacctggaa aaaccaactc 180

ttgcaatcat cggttta 197

<210> 166
<211> 419
<212> DNA
<213> Rattus norvegicus

<400> 166

aattcagttt acatcttggt cacagcccat ctctctcctc ttccttagtc ccatccttgc 60

cagatccctg tcccaattgc cccctccact tgggtaccac ctaaccctgg gacatctgct 120

tcatgtagta ctagctatat cctttctcac tgaggcctaa ccaggcagtc ttggtaagga 180

tgagatccaa tgctaggaac tatagactga gacaacccca gttctgttgg gagcagctaa 240

agatggcacg acatccagtg gtcttttgtg gtatacaacc ataacatggg tatatagcca 300

tgtccctggc cttcttctgg catttacaag gccagggtga taagcatgtc aataaggtat 360

ctcacacccc accaatcctc agaaggacaa gtttacagcc actgcctgtt ttgtactta 419

<210> 167
<211> 159
<212> DNA
<213> Rattus norvegicus

<400> 167

aattcagtct tatcaatgaa ggtcagagcc attgggaaag gtgaagtggg ggagccctgt 60

catcgatccc aactgggtcg gaaccctccc acgcatgact caattcagag ctgtttccca 120

ggaggctggg gcgggatgca gacagattcc aacacctta
159

<210> 168
<211> 110
<212> DNA
<213> Rattus norvegicus

<400> 168

aattcagcag aactccttga gggaaaatca tgatccagtt atgatttcat cccgtggcac
60

aacctttaga ataatgggtt ttgttggttg aagaagtcct tgtctgctta
110

<210> 169
<211> 199
<212> DNA
<213> Rattus norvegicus

<400> 169

aattcatcgt aaatggactc ctcaacaaaa agtctggatg ctgcgacaca aatctgaccc
60

tggtggaaga atactccttg gtgtgcaaac tcatcagcac tatccaagtc agcatctgca
120

aacacaatgc aagggctctt tcccccaagc tccagggtga ccctcttcag attgcttttc
180

cctgcagctt ctttgatta
199

<210> 170
<211> 380
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 170

aattcctagg gaagtcggaa ccagagcgcc agcactgagc ctggcccgtg aaggagcatg
60

gagacccacc ttccttccct tctccctgaa cagcagtctg gcacccagaa gctcagagtg
120

ccaccacctg tggtgctcag gagcccagcc tagaaagagg actccgacac agcgggcagn
180

ggctccacag acggatctat gaggaaaata cgggggcagg cangcaggca ggcgaccccc
240

tgaccctctg gtggccgctg tatctgagcc cttttgggaa ggcttataga caacaggtgg
300

agcccatacg ctgggcatag ggagcctggg aagggctcag gagctcagga ccactccagg
360

ctctctagca ccaccgctta
380

<210> 171
<211> 366
<212> DNA
<213> Rattus norvegicus

<400> 171

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60

tttgcagcaa gtactcggta cgaggctacc ccacattgct gcttttccgg gggaggtgag
120

aaagtgggtg agcacaatgg aggcagagac ctcgactctc tacacagctt tgttctgcgc
180

caggcaaagg atgaactcta agaaccctgg tgaagccgtc atccaccctg gccttatgca
240

ccccgtgcat aggagtgacc tcacatggac atgcgtatct tcactgtggt tagtcagaac
300

gctgaatgta ttgagcttgt gttgcttgct gtgtgccctt tgagccacca cacactacgg
360

acctta
366

<210> 172
<211> 339
<212> DNA
<213> Rattus norvegicus

<400> 172

aattccatca gtaaagctaa agcagctacg tctggtccgg tctcttcttg atctgtttct
60

agatatggaa gcagctacag ggcaggaggt cgagctatgt ttagaatgca tcgaatgggc
120

caaatcagag aaaagaacct tcttacgcca agcattggag gcaaggctgg tgtctttgta
180

ttttgatacc aagaggtccc aggaagcatt acatttgggt tctcagctgc ttcgggagtt
240

gaaaaagatg gatgataaag ctcttttggt gaagtacagc ttttagaaag caaaacttac
300

catgctctga gtaatctgcc gaaagcccga gctgcctta
339

<210> 173
<211> 290
<212> DNA
<213> Rattus norvegicus

<400> 173

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60

gtgtcgtgga ggccgcatgt ttgcaccaac caaaacctgg cgtcgttggc atcgcagagt
120

gaacacaact cagaaacgat atgccatctg ttctgccctg gctgcctcgg ccttaccagc
180

tttggtgatg tctaaaggtc atcgtgttga ggaagttcct gaactgcctt tggtggttga
240

agataaagtt gaaagttata agaagaccaa ggaggctgtt cagctgctta
290

<210> 174
<211> 199
<212> DNA
<213> Rattus norvegicus

<400> 174

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60

gacttgactc caccccagct tccaccttgg ccgggactgc tctaccctgt gagccaaaca
120

ctttaggtgt aagtaggtac actttgtgat gtcactgacc tagtgtaccc tttcttttt
180

catatctata ctgacctta
199

<210> 175
<211> 165
<212> DNA
<213> Rattus norvegicus

<400> 175

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atcttctcac ggcatccctc atctcacaag tgtccaggac catggggaca ttgcattcaa 120

agcaccgtac ctgctttcta attgatggtc aaggttatat gctta 165

<210> 176
<211> 46
<212> DNA
<213> Rattus norvegicus

<400> 176

aattccagca ataagaaatg aacaaagatt ggagctgaag acctta 46

<210> 177
<211> 39
<212> DNA
<213> Rattus norvegicus

<400> 177

aattccgaat gtggattgtg attttcctgc ttccactta 39

<210> 178
<211> 283
<212> DNA
<213> Rattus norvegicus

<400> 178

aattccaccc aaggctgctg ggtctgactg gttctacaga acaagtggcc catgctagtc 60

gcaactaccg tgtatactac agcgctggtc ccaaggacga ggaccaggac tatattgtgg 120

accattccat tgccatctac ttgctcaacc cagatggtct cttcactgat tactatggtc 180

gtagcaggtc agcagagcag atcgtagaga gtgtactgcc ggcacatagc tgccttccat 240

agcatactgc cctgaactgt gtactgccta ggccctgtca tta 283

<210> 179
<211> 223
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 179

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60

cactcggctg tacaagtgga tccccagaa tgacnttctt ggtcatccna aaaaccnaaa
120

gcttttgtag ctcatggtgg aacaaatggc atctatgagg caatctacca tggcattcct
180

attgttggta ttcccttgtt tgcagatcaa ccggataaca tta
223

<210> 180
<211> 182
<212> DNA
<213> Rattus norvegicus

<400> 180

aattccctgg ctttctgggt ctagagtgtt ctgtgcctcc aaggactgtc tagcgatgac
60

ttgtattggc caccaactgt agatgtatat acggtgtcct tctgatgcta agactccaga
120

cctttcttgg ttttgcttgc tttttctgat tttataccaa ctgtgtggac taagatgcat
180

ta
182

<210> 181
<211> 189
<212> DNA
<213> Rattus norvegicus

<400> 181

aattcctcat tggtcatgtc accgaaggcg ttcatctcca tggtaaagcc gtgcttcccg
60

ttgctgtact ccccattgtg tagctggatc atcctcatgt tcttctccca cactgctctc
120

ctccactctt cctcattcgt gccatacagt cttctgtgtg tggacttcca ctggtgccac
180

tgtgcatta
189

<210> 182
<211> 160
<212> DNA
<213> Rattus norvegicus

<400> 182

aattcggggt cctctgaaag ctacccaggg ttctcatctt ccctagagct tgtagtgtaa
60

agtgacagct agtgtgtgcg cgcgctctct cgctctctct ccttctccct ctctctctcc
120

ctattccctc ccctcctctc ctctgcccct tcctggttta
160

<210> 183
<211> 287
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 183

aattcggggt gaagnagaag ccgatataca tcaatgtcgt cagggaccga ttgagaggct
60

agtttcctac tattactttc tgaggtttgg agatgattac agnccgggac taaggaggcg
120

gacacaagga gacaagaaga ccttcgatga atgcgtggct gaggcggctc agactgtgct
180

ccagagaagc tctggcttca gatcccgttc ttctgtggcc actagctcag aatgctggaa
240

tgttggaagc agatgggcga tggatcaagc taagtacanc ctggtta
287

<210> 184
<211> 135
<212> DNA
<213> Rattus norvegicus

<400> 184

aattcgtcaa agcagcacca ggcccccgac tgtgccaaac cactgaagaa gcgccccatc
60

atctgaaagg caagcaaagc tgatcaactt caggctgcct tgttggtcat ctctaacatt
120

cataatctag agtta
135

<210> 185
<211> 79
<212> DNA
<213> Rattus norvegicus

<400> 185

aattcgacag tgtcccatgc agacattact aattgattct gttcttatta tggaaccttt
60

tggctggcca ggtgtgtta
79

<210> 186
<211> 413
<212> DNA
<213> Rattus norvegicus

<400> 186

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60

ggggagctat gcgaggaaaa cttattgttc aaagtcctat tgaccccaag aacataccca
120

aatacgacct cctctatcaa gacatttagc actcgctgct gttggagaga agagaggcac
180

aggctgaagc agaacctgaa ctcagagagc ctgtggtctg gagtccctca gagacatgct
240

cactgcctga gcaaagaggt ttcataggtc tgtaatcaac ggcccctctg cagaagcccc
300

agtgctccca gaatggagat gcctgagcgc ccattctctg agagcctcag agcagtgagc
360

gagtgacagg tggcattgta acggaccctt tatcttgact gtctttcccc tta
413

<210> 187
<211> 362
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 187

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60

gcttttcagc cttcccttcc gagctactgc atgccccaga aaagtgggtg aaggtcaagt
120

ccccaaactc atctcctatt cctacatgga acgtgggggc cnctttgctg cctttgaaga
180

gcccaagctt ctggcccagg acatccgcaa gttcgggtcc ctggctgagc tgcagtagtg
240

acactggata ccaactgtgg ctttagcagc agccctggtt cctcccaagt cacacttatg
300

gaagatgacc cctttctnag gaataagttt gttccctgac cacactcgag gacccagact
360

ta
362

<210> 188
<211> 74
<212> DNA
<213> Rattus norvegicus

<400> 188

aattcggggc tgtttcagat ttcctacact ctgattggta ggtgtgtcca tctggacagt
60

ttattctagc ctta
74

<210> 189
<211> 267
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 189

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60

acctgcttct ggcggcccgc tcgggtccgg cgcgcctcct ggccctacca gcctatctgc
120

ctgggctgga ggagctgtgg agcccacggg ctctgctgct gttgttcatc tggctcggcc
180

tgcaggtggc gctctatttg ctgcctgcac gcaaggtggc cgaggggctg ganctgaagg
240

acaagagtcg cctgcgctac cctatta
267

<210> 190
<211> 192
<212> DNA
<213> Rattus norvegicus

<400> 190

aattctaaac atatgccatt gtggaagaag caaagccacg gagatagcag gccagtgcag
60

attcactgat gtgacaactg cattctctca ggttaggaca ttggtggaag gagcctctgc
120

acttatgggc tgtgtagcta tgggaacctt gtacttcctg ccaattttgc tctgaaactc
180

aaactgcctt ta
192

<210> 191
<211> 83
<212> DNA
<213> Rattus norvegicus

<400> 191

aattctagat ttcttggtaa actatcaaat ctgtatatgt atgtaataaa gtgtctaatg
60

ctaggagttt attggaaggt tta
83

<210> 192
<211> 56
<212> DNA
<213> Rattus norvegicus

<400> 192

aattctcaga aactatataa tacattctgc tgttggccaa tgcaaagtgt acttta
56

<210> 193
<211> 42
<212> DNA
<213> Rattus norvegicus

<400> 193

aattcttcag aaatgtggtg tctaagaaca ccagaccctt ta
42

<210> 194
<211> 133
<212> DNA
<213> Rattus norvegicus

<400> 194

aattctatgc attgatttac atgtactgaa ccatacttct ttgactgtaa tggagccaac
60

ttgtggtaaa tggttatttt catatgttct tgacttgata tgaaatattt tactataaac
120

ttttcatatg tta
133

<210> 195
<211> 79
<212> DNA
<213> Rattus norvegicus

<400> 195

aattctgacc acatgagctt cctagacaga gtgaagaata tgctttatcc tgtgccatgg
60

atgtatttat gccatgtta
79

<210> 196
<211> 65
<212> DNA
<213> Rattus norvegicus

<400> 196

aattctcctt gtagtagcgt tgggaggaga caatggttcc tgtcgtccag tagatcatga
60

tgtta
65

<210> 197
<211> 64
<212> DNA
<213> Rattus norvegicus

<400> 197

aattcttcag aaggtatgtg aagctatttg catatgtaaa taaactgcta agattgtcat
60

gtta
64

<210> 198
<211> 41
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 198

aattctgcga nnaagttcaa atacaatagt gctggcagtt a
41

<210> 199
<211> 36
<212> DNA
<213> Rattus norvegicus

<400> 199

aattctgcaa attgccttac agactagcca tactta
36

<210> 200
<211> 218
<212> DNA
<213> Rattus norvegicus

<400> 200

aattctctac catctgttac aggctgtggg atgtcagagg aaggaacggg gtttggtggt
60

ggtacccagg gcaggaccga gcagcaggat tcccgcaaga gaaaggaggc agatgggcct
120

ttcaagagct ttaggaagcg actaacagca gagtgtctgg gaacatacga atcagtctct
180

tgcatattgt aataaaccaa acacaagact cgccatta
218

<210> 201
<211> 151
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 201

aattcagcct gaggaggaaa tcagtctatg gtntacttcg tcctgcctct tagcttctgt
60

acctgcttgt cacatttgca cctatgagtc aagacatgtt tgttaccttt attttgattt
120

atttctatta caattcaatt tttttccttt a
151

<210> 202
<211> 63
<212> DNA
<213> Rattus norvegicus

<400> 202

aattcagtca cggactttat gcctttgaaa gttgtcacca ttttattgtc accctccatc
60

tta
63

<210> 203
<211> 221
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 203

aattcctctt atcaactgca tacaaagtgt nttcaataca attttttccg tataaaaata
60

ctgggaaaaa ttgataaata acaggtaaga gaaagatatt tctaggcaat taggattgtt
120

gggacagtga gtcctgtggg gtgtttggac acagccacag gacaggcctc ctgacagtgc
180

tgcagatcag acggcaaaag aaagcagaac tgtctggttt a
221

<210> 204
<211> 178
<212> DNA
<213> Rattus norvegicus

<400> 204

aattcctcca tcattgcaga ccggattgca ctcaagctgg ttggccctga gggctttgta
60

gtgacagaag caggattcgg agcagacata ggaatggaaa agttcttcaa catcaagtgc
120

cggtattctg gtctccagcc tcatgtggtg gttcttgttg ccactgtcag ggctctta
178

<210> 205
<211> 233
<212> DNA
<213> Rattus norvegicus

<400> 205

aattccagaa gaaaaaggca ggatcacagt cctagtgggg aagctgcttc ctggtccacc
60

cgaagacacc aagttcaacc accgtccatc cagaaatgag aagaacaata ccctagagca
120

aagtcatcca cacccagtac acactccgct gctaacctga aatgcatgaa cagaaaccca
180

tagtatttat gcccctctag gcaggtgtcc acaataaaat tgtgagcagc tta
233

<210> 206
<211> 74
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 206

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60

gactcattac ttta
74

<210> 207
<211> 54
<212> DNA
<213> Rattus norvegicus

<400> 207

aattctccag ataatggtca ttaagacaat tctttccagc atgctcaagg gtta
54

<210> 208
<211> 240
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 208

aattcacggg aaatgncttg tgcttagcat ggagaagaag gaagtggaag ggaatgggga 60

tcaaactctt ctaacattgc aatatgctaa tattgttaga ctgctacaga tgcactgaaa 120

cacagaatat gatcttttaa ggggccaaaa atgctacggt gtgaaaatat cacaatgact 180

gtctttncct taaaaaagtc acataaaatg cagtttagaa caaggngaaa cataggtcta 240

<210> 209
<211> 147
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 209

aattcagggt atgnnnngtg gntataaagt acatttctgt agtgtgtgtg ctaccttagt 60

ttnatgttct ttatgaaaaa ttaaaaacct ccccctccac aactttcctc ttgctttgaa 120

tataggtaag atcataacat ctatcta 147

<210> 210
<211> 67
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 210

aattcatgga aaacnnntat gttattttta atacataatg ttcaaaataa nnatatgttc 60

tactcta 67

<210> 211
<211> 41
<212> DNA
<213> Rattus norvegicus

<400> 211

aattcattct gttttttaa tctaactttt atatcaatct a
41

<210> 212
<211> 99
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 212

aattcatctc ctccngaaag caaagttatg actattcttt ttcacagatc aaattacaag
60

gggactaata gtgatgtaat ggnacccatg ccctgccta
99

<210> 213
<211> 141
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 213

aattccatgt ctatggnttc caagtcngna gagaancacn nggatgactg ccaggaggac
60

ccaggtttcc agtgtgagag ctgaaancag gtccatccct gcttgtctgt cancaaatta
120

ctcctcggtg ttctccctct a
141

<210> 214
<211> 134
<212> DNA
<213> Rattus norvegicus

<400> 214

aattcctcca ccatttaatt cagctccaat caattttcaa tattgtctac actgttccct
60

gcaaacccat acccattaag atttatgact attcctccta ccctgtttcg cttgctgtgc
120

cacgtgctaa tcta
134

<210> 215
<211> 121
<212> DNA

<213> Rattus norvegicus

<223> unsure at all n locations
<400> 215

aattccccga cccagagata tttgaccctg gccacttttt agatgggaat ggaaagttta
60

agaaaagtga ctatttcatg cctttctcag caggaaaacg gatgtnncag ganagggtct
120

a
121

<210> 216
<211> 254
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 216

aattccgtaa agaaataata ttctccttca aaaagaggct ggcccgattc caccgaagga
60

aagagatgga aaaaaacaaa caaaccatcc tgaagtcagc ttctccatgt actgtcacaa
120

tgagagactc aattgcctcg tgagtgtggt ggagggagga aaaagggttc atacctgcct
180

cattaggaag agcagaacta tggttaagan cacagtggac tggatgttac actcantnnn
240

ccacttaata gcta
254

<210> 217
<211> 107
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 217

aattccgnnc cgaacaaggc cacangtgan ncttactgga ntccatgctg ccattttttt
60

gtctgaaaat gtcagtactt aaaagtattt aggnaacact cgagcta
107

<210> 218
<211> 37
<212> DNA

<213> Rattus norvegicus

<400> 218

aattccttgg tattcggtat cagtaggaat ggggcta
37

<210> 219
<211> 291
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 219

aattcctgac cantgnnggt ctgganaaga ncccagagga gatccaacgc ctgtnccagg
60

anaagaaggt ggacntgtcc aagcccttgg taagccacat gcggctccgg tgtcacagcc
120

tgccacgtgg tcctgggggc cttcctctgt ggcaaacccg atgtgcctgt ctacgatggc
180

tcctgggtgg agtggtacat gcgtgcccaa ccggagcacg tcatntntca gggccggggg
240

aagaccctgt gaangacaca gtgcagcttg ggtgacaccg gaaccatcct a
291

<210> 220
<211> 289
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 220

aattcctgga aaaagacata tcagaggaan ttcttaataa aatcatctac cacacctcct
60

ttgatgtaat gaaggaaaac ccaatggcca actataccac tctaccctcc agtatcatgg
120

accactctat atctcctttc atgaggaaag ggatgcctgg agactggaan aactacttta
180

ctgtggcaca aagtgaggat tttgatgaag actaccggag gaagatggca gggagcaata
240

ttaccttccg cacagagatc tgagagcagt gaggnagagg ganncccta
289

<210> 221

<211> 91
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 221

aattccaggc cagctnntca antaagatcc tatcttaaag tanaatgaaa tagggttggg
60

gatttagcta cantgnnana gcacttgcct a
91

<210> 222
<211> 166
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 222

aattcccaaa acctnnnacg aagtctccgg antgagtcaa ctataccgct ttcttggcat
60

gagtccagag gcctccgact ccacagagan cagctcagtn ttcgtcttta ctgcgctaca
120

cgtagaagag ctaagaaatg gagccggttn ncagaccccn ggacta
166

<210> 223
<211> 112
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 223

aattccagan tcagcaccaa nngacagacc attctaaaat gggcaaagga ctgaacggat
60

gntccggatt gacagtgacc acacagccca tganganccc acaggaccac ta
112

<210> 224
<211> 65
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 224

aattcgtaaa gagganncte acnntgaaaa cataaactgc cacagtaagn ncacaaacct
60

gtcta
65

<210> 225
<211> 44
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 225

aattcgccaa gagcgtttga ntgacagctc tttgtgtatg tcta
44

<210> 226
<211> 105
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 226

aattcgatgt gggnnccata naaagtangg aaaaatatgg ggttgtntga tggtcaaatg
60

cctctgtttg ccatcacnga cacagaaatg ancaagaatg tgcta
105

<210> 227
<211> 110
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 227

aattcgagac ccaanncacn aaccnaaacc cacaaccaca acagtaacna gaacaagaag
60

aaagaaagca aaagggttgg gatttagntc agtggnagag cgcttgccta
110

<210> 228
<211> 392
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 228

aattcgggag tgnggnncct tctgantctt gcancaaaga ggctnttcta tagcatgnnc
60

nangatgctg gcttggtgtg aacnnatctc tggcatatct gatgangatg cangnccagg
120

atcccantgt ccangnatga nccagcaacc ctggaaacct acactcccca gagaaaaacc
180

anaaattgaa agaanancaa actaaaagga ngcnaaacac ataaagcatc antcacagtt
240

tgnnccagcc tngatctgac ntcgaanaag cctgaagaca gatgtgcccc ncttcanaca
300

cgtctggctt ctggcaccac ttgtgagctn cctgaaagtc accannctcn tgctgtntcc
360

caanncaang nnatgagnnc ccnaacacac ta
392

<210> 229
<211> 81
<212> DNA
<213> Rattus norvegicus

<400> 229

aattcggaag gactctccaa tgtcgttcag ggagatatag ccgctttcta tctaagaaca
60

tcattacttt aacaagtact a
81

<210> 230
<211> 203
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 230

aattctggac caagactctg ccccagaaga tccaagagct aaagggttct caggacaatc
60

acacagagct ataatgtcct gtgtcaagaa aactgtgtag acttgangta cagggtttct
120

gaagcctcta aagtctacac ttgaatggat atatcacatc tgttggatga ccctgcaatt
180

aaggttgaag tcgaccatgt cta
203

<210> 231
<211> 110

<212> DNA
<213> Rattus norvegicus

<400> 231

aattctgctc tgtgtatcct gatccaccaa gcagtcactt ggtagcagaa aagtggtctt
60

atgtctgctc ttaactgtgg tggcgcttct gggactgtct tccagctcta
110

<210> 232
<211> 252
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 232

aattctggaa taaganncct gtttttaaaa aaggaactgc cgcaatctga aagacttcca
60

aagaangtta gagcacagta catactaccc ctgccctgct cccaccaccc gctctccaca
120

accctccccc atgtgcaact gacactcctc cccagtcgat gctcctacct acctttcagc
180

ccacgtcatt cgtagtgtcc atcttgtnaa gccctgttgt gccacacagt ntaacnngcc
240

cccctgcagc ta
252

<210> 233
<211> 120
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 233

aattctgtgt gaaaancctc anaccacttc tcctgggncc tttaaactcc tggaggttta
60

gggaggccag tttccatccg cactgaattg gggagaanaa aactggnccc aattacgcta
120

<210> 234
<211> 47
<212> DNA
<213> Rattus norvegicus

<400> 234

aattctaagc cgagtttaac atgttcaaga tatctccgtt tcagcta
47

<210> 235
<211> 121
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 235

aattctccga cccggnnata tttgaccctg gccacttttt agatgggaat ggaaagttta
60

agaaaagtga ctatttcatg cctttctcag caggaaaacg gatgtgtnca ggagaggcct
120

a
121

<210> 236
<211> 65
<212> DNA
<213> Rattus norvegicus

<400> 236

aattcatcca caccaactgg acatgcccac ggtggcagtg tgtcgtcctc ttcatacaat
60

gccta
65

<210> 237
<211> 49
<212> DNA
<213> Rattus norvegicus

<400> 237

aattccctac acagaccaga actggctttt aactctacca ctacgtcta
49

<210> 238
<211> 48
<212> DNA
<213> Rattus norvegicus

<400> 238

aattccctgg gtgcctttct ttacaaaatg ggttcaataa ataagcta
48

<210> 239
<211> 74
<212> DNA
<213> Rattus norvegicus

<400> 239

aattccatat gtaataggat gcaagtctaa gcgtttcatg tggacataaa tgtatctaaa
60

taaaacttcc ccta
74

<210> 240
<211> 142
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 240

aattccaggc tgggnttgcc tttctctgct ttcatgacct cttgacccca acgagctgat
60

gttaggacca caacactggt aggtggttaa aaaacaagca acaagggctg gggatttagc
120

tcagtggtag agcgcttacc ta
142

<210> 241
<211> 184
<212> DNA
<213> Rattus norvegicus

<400> 241

aattccaaga gtgacttgct ccctccccct tctccaccga aaaccaccca aagtgggaaa
60

tgaatctctt caccagcacc cctctggcca caggcaaagt atgccacagg cctctgacat
120

actttggaca gactgccagc taacacccac cacccccatg ttaagacaca tctctggatc
180

ccta
184

<210> 242
<211> 71
<212> DNA

<213> Rattus norvegicus

<400> 242

aattcccaag gtcaaatgcg gttagctgct gtggacttcg atatggaaca tgttacctct
60

ccctttgcct a
71

<210> 243
<211> 391
<212> DNA
<213> Rattus norvegicus

<400> 243

aattccccta cacattggat taatcttact aacatgacaa aaaattgctc cactatcaat
60

tctataccaa ttttatcaac tcctaagccc aactatcacc accattctcg caatttcatc
120

agtctttgtt ggcgcctgag gaggacttaa ccagacccaa acacgaaaaa tcatagcata
180

ttcatcaatt gcccacatag gatgaataac agcaatcctt ccatacaacc ctaacttaac
240

cctcctaaac ttaacaattt acatcctact tactgttcca atattcatca cactcataac
300

aaactcagca acaacaatca acacactctc actcgcatga aataaaactc ccataatcct
360

aaccatagca tccatcatcc tcctatcact a
391

<210> 244
<211> 175
<212> DNA
<213> Rattus norvegicus

<400> 244

aattcgccct gtcgggatga gagagtggga gactgagtaa ccatggctcc gccgtgccct
60

cactggctct tttccgtgta gcatctctgg gcaagtgagg gaggcatatt agtttccatt
120

tgcaggtgtg gaacactgag ccccagaaag gacaagaaga ctcattcagt agcta
175

<210> 245
<211> 194
<212> DNA
<213> Rattus norvegicus

<400> 245

aattcgccaa ggatgactcc gatagcatga gccgaagaca gacttcttat tctaacaacc
60

ggagcccaac gaacagcact gggatgtgga aggactcgcc caaatcttcc aaatccatca
120

gattcattcc tgtctccact tgagccccac gttcacgcag cccgactctt gggagggact
180

tttgtgtcca gcta
194

<210> 246
<211> 44
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 246

aattcgggct ggggatttag ctcagtggan aaacgcttgg ccta
44

<210> 247
<211> 198
<212> DNA
<213> Rattus norvegicus

<400> 247

aattctggag atgggacacg aggatcagtt caaggtcatc cttagctact cactgcatag
60

taagtttgag gtctgcctgt gctacatgag accgagggag agaaaggagg ggaaggagtc
120

aagcggtagt tgcctttaat cgcagcattt gggaggcaga ggcaggtgga tctctcggtt
180

tgaggccagc ctggtcta
198

<210> 248
<211> 332
<212> DNA
<213> Rattus norvegicus

<400> 248

gatccgccac tccttctgca tacatgtcga tgagggctct ctccttcatg tccttcccat
60

agaggttgta tttggtggca atgtagttga gaatggctct ggtctgcacc agcttcatcc
120

catcaatctc caccatgggc acttgctgga acatcaaact cccatcattc cttagcctgg
180

ccaggtcatc ccgagttttc agaaattgtt cttcaaactc tactccagct gcagccagga
240

gccaccggat gggctccatt ctccccctgc catcgaagta gtgaaggact ggcttccccg
300

gcatggcagc aattgcttga gttctcttgt ta
332

<210> 249
<211> 481
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 249

gatcctgggt gttcgcagca cagtcctggg tcactggccc agaggagccg tggtatcaag
60

gcacaaagtg aggaagtggt cctgggaggg gcgggggcgg ggcagctccg agctcaggca
120

gtagggcact catggtacca tgagggtggc cagtctgcag gaggcatgga gtgaaggcca
180

gtgctggctc cacttgggaa gaaagggctt acagagcccc ggagtccgag gcagttggtc
240

tctgccancc atggcgtatc caagcctcct atccattccc cctgtacctc tggagatagc
300

ctgtccataa gatggctgtc ctgccctact ggggccactt gaagaacaaa atgtcatttt
360

attctcttga gaaaagaaaa agagggaatc atttttgccc ctgcttggat gcctagaagt
420

ctaataagcc tcattacaaa aagacgtttt ctcggtctca tctggcgttt tctttggctt
480

a
481

<210> 250
<211> 441
<212> DNA
<213> Rattus norvegicus

<400> 250

gatcctgtgg taggagtctt gaaatgcccg ttgaactgct gagaggatac tccacactcc
60

accatcgact tccgtaggct tctcagcaac ttggaattgt tcttgatctt caggtttggt
120

gaccaccatg tgcgtgagag gagtgacaaa attgtacttg agtgacaagt tcagaacttg
180

ggcctcgagg gcctctaact cagctcctga ggctgaaatc ctctgctcca gctgttgctg
240

tatggtcagc aacgcccaga gtctctccat aaagttatga aagatgtact taggaccctg
300

gaactctttc tcttgttggg ctatgctggc ctccgtttgg aaagtgatgt tctgcaggtg
360

catctgccca ctgactttgg ctaagaggac atcagggccc tggtcccgga cttcccagcc
420

accaccatct ctgagccctt a
441

<210> 251
<211> 193
<212> DNA
<213> Rattus norvegicus

<400> 251

gatccacaca accaaaccaa catgagtgaa agagttagca acacggcctg tggttcgcct
60

atgtttgggt gtcttggagc aaagctgcta tggagaaatg tgcaggtgcc taggggatgc
120

tgtactgctc tagaggatgt aactcaactc acagggtgac tttttgatgc ctgacccaat
180

tactagttga tta
193

<210> 252
<211> 156
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 252

gatcctggga ggatgttgac cacacccttg ggaatgccag ccttcagtgt cagctcggca 60

aacttcaagg ntgtgagtgg ggtcacctgg gcaggcttga tcaccacggt gttcccagcc 120

gccaggcagg ctgcatcttc caggatacca tcatta 156

<210> 253
<211> 101
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 253

gatccgaacc caagaggtaa aaaccttccc gcgcgaccag aagtgtccga ggctttcccg 60

gaggcggtgg gacttacttt cccaagaana aagcaggatt a 101

<210> 254
<211> 228
<212> DNA
<213> Rattus norvegicus

<400> 254

gatctgcacc gttttgaagg aggaattcta ccacagctat ttgcccgtgt gccgcagccc 60

acatcagggg agtaaatcct tcttcatccg tgtgattgat aacattttct tgttcaatac 120

gagtagccag gtagagcatc tctccctgag ctgccaactg gtgaacagac agagaatttg 180

ctaacagagg tgtggtggag acctcgtttc ccctgtgctt gttggtta 228

<210> 255
<211> 177
<212> DNA
<213> Rattus norvegicus

<400> 255

gatctttacg tggtggctct ttaggtagtg gacttttatt tactcccaag ggcatcattt 60

caaactctcc ccctcttggt gaaagttcag attccacagc aggtgctgat agtacaacca 120

tgtccatttc ataacaatat gtaggatgtt tgatcttcaa gttggtgaat gctgtta 177

<210> 256
<211> 447
<212> DNA
<213> Rattus norvegicus

<400> 256

gatcttgggg tgtgggtagg gatttccagg gtgaaggtag attatttatt agggtgggaa 60

tgtttcattt acatgaagag gaatatgcca agaacctgct ggacaagttc atatcctgaa 120

agaggaagtt gaatctgtaa tctggccata agttatgtga ctttcctcag aggatttctg 180

gggttacagg caggagtggc tgattggtca taacagtacc taattatcat atggtgggaa 240

ggactgagtg ggatgtatgt gctgaacctt gtggcacttg caggaagctt tgtgcaaggc 300

cattctctag ataaggtcag gcacttgtgc ttagaacact ttccagataa gattgggcaa 360

aggagaggaa accccactga gaaagggagt cttccatttt gcaccaggtt cagagagctt 420

atctagacat ggtcgacttc aacctta 447

<210> 257
<211> 350
<212> DNA
<213> Rattus norvegicus

<400> 257

gatctaaaat acctcgggaa tacatgtcaa tcagggctct ctccttcatg tccttcccat 60

agaggtcata tttggtggcg atgtagttga gaatggctct ggtctgtgcc agcttcatcc 120

cgtcaatctc caccatgggc acttggtcaa acatcaaatt cccgtctttc tttagctttt 180

ccaagtcttc tggactctgt ataaacttct cttcaaactc cactcctgct gcagccagga
240

gccaccggat gcactccatt ctgccccggg cattgaagta gtgaagcact ggcttcccag
300

acatagcagc aactgtgctt tcactgtcta gcgagaatcg tggcttctta
350

<210> 258
<211> 155
<212> DNA
<213> Rattus norvegicus

<400> 258

gatcttcacc attggggttc ccagttcttg caaagttggc ccagtacttc atcaccctcc
60

tcttcagcag ctcctcctcc tcagtgaggt caaaggtcat gccccacaag taggagccaa
120

agacaaagag aatgtcatca ccatggtctg cctta
155

<210> 259
<211> 37
<212> DNA
<213> Rattus norvegicus

<400> 259

gatccgtacc ctaggtcaga gctgtgatct ctgctta
37

<210> 260
<211> 40
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 260

gatcctggng atcagtgtgg ggctcacctc caatgggtta
40

<210> 261
<211> 224
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 261

gatcctatgg gctccgtggt cagctagcct agccagcata nggagctcca ggttcagtga
60

gaagacttgt ctcaaaaata agagggaaaa agcaaatgag gttgtcacaa atgtgtactc
120

gtcatacaaa tgccatccat gcaaatgtat acacacacac actcacacac tcacacacac
180

acacacacac acanacanac acacacacnc ncnnataccc atta
224

<210> 262
<211> 31
<212> DNA
<213> Rattus norvegicus

<400> 262

gatcttgaaa agactgtttc cttcatgatt a
31

<210> 263
<211> 53
<212> DNA
<213> Rattus norvegicus

<400> 263

gatcttcgaa ctaaacgctg gggcgcccac ctccgaatcc caatttctaa tta
53

<210> 264
<211> 63
<212> DNA
<213> Rattus norvegicus

<400> 264

gatcctaact cattagtgta aacgaccctc tccagcgtcc ctgcgcccat ctttctgtcc
60

tta
63

<210> 265
<211> 105
<212> DNA
<213> Rattus norvegicus

<400> 265

gatcctattg aggcgagcag ggacctggct ggacaaggac acacttaaaa cccgattttg
60

ttccaaattc tgggaaacat agacatttaa ctctgaagat gccta
105

<210> 266
<211> 66
<212> DNA
<213> Rattus norvegicus

<400> 266

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66

<210> 267
<211> 137
<212> DNA
<213> Rattus norvegicus

<400> 267

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aagcagaagc tgggcctgca tgtactcatc tacatcatgg aggccagtga catcaggagc
120

cccgtcacac actacta
137

<210> 268
<211> 197
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 268

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tgtttcttgg ctcctctctt gtcatctcac ttgtcctgcc ttctcctgac agtaacagct
120

gttcntcagg tcaactggat caggccccca tgtcctctaa ggagcaggaa gtcctcctac
180

ctaccctacc caccctа
197

<210> 269
<211> 40
<212> DNA
<213> Rattus norvegicus

<400> 269

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40

<210> 270
<211> 109
<212> DNA
<213> Rattus norvegicus

<400> 270

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60

cagggtttca cacatctcag gattggccat gaactcacta tgcagccta
109

<210> 271
<211> 51
<212> DNA
<213> Rattus norvegicus

<400> 271

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51

<210> 272
<211> 36
<212> DNA
<213> Rattus norvegicus

<400> 272

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36

<210> 273
<211> 36
<212> DNA
<213> Rattus norvegicus

<400> 273

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36

<210> 274
<211> 67
<212> DNA
<213> Rattus norvegicus

<400> 274

gatccacttt tattaggaac aaatgcaatc tcaaatcagt acaattaggc ttcaagagtt
60

gatatta
67

<210> 275
<211> 287
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 275

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cattggaaga ccttagagtc agaatcttct tgtgtaagag ccctgaatgn tgtgaccaac
120

cccagtgtct acagcatctt tgcagctgtt aatctcactg ttctcgttcc tattgaagaa
180

attactggcc cagaaatgcc tttggtgtgt ttggcagact ttaaggcaca tgcgcaaaag
240

cagctgtcta agacctcctg ggacttattg aaggagaagc tgacgac
287

<210> 276
<211> 260
<212> DNA
<213> Rattus norvegicus

<400> 276

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120

agacagtgga aaattgaagg gacgccatta gaagcaatgc agaagaagct tgctgcacga
180

gggctgaggg atccatgggc tcgcaatgag gcttggagat acatgggcgg cttgcagaca
240

atatcacctt cacgagcgta
260

<210> 277
<211> 299
<212> DNA
<213> Rattus norvegicus

<400> 277

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ctgaaggaga tggcccagtc gatcttcatg gcaggcatac tggttggagg acctgtgatt
120

ggagaactgt cagacaggtt tggccgcaag cctatcctga cctggagtta tctcatgctg
180

gcagccagcg gctctggtgc tgccttcagt cccagcctcc ctgtctatat gatcttccga
240

ttcctgtgtg gctgcagcat ctcgggcatt tctctgagca ccgttatctt gaatgtgga
299

<210> 278
<211> 139
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 278

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120

gtgggggact gcgttcgcg
139

<210> 279
<211> 328
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 279

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gctgggggaa gattggccat ggtggtgaat atggcgagga ggccctacag aggatgttcg
120

ctgccttccc caccaccaag acctacttct ctcacattga tgtaagcccc ggctctgccc
180

aggtcaaggc tcacggcaag aaggttgctg atgccttggc caaagctgca gaccacgtcg
240

aagacctgcc tggtgccctg tccactctga gcgactgcat gcccacaact gcgtgtggat
300

cctgtcantt cagttcctga gccatgct
328

<210> 280
<211> 312
<212> DNA
<213> Rattus norvegicus

<400> 280

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aaaaaaacct gtcactgtcc ttttcctgcg accatgtctt ccatcaagat tgaatgtgtt
120

ttaagggaga actacaggtg tggggagtcc cctgtgtggg aggaggcatc aaagtgtctg
180

ctgtttgtag acatcccttc aaagactgtc tgccgatggg attcgatcag caatcgagtg
240

cagcgagttg gtgtagatgc cccagtcagt tcagtggcat tcgacagtca ggaggctatg
300

ttgccaccat gg
312

<210> 281
<211> 289
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 281

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cattctccct agcctgcntc tcttgccccg naacgcgggg ngcaggtttg ctcctaaaan
120

ctctgtgcat cttcgatgat aaggaccaac agctgggggt gtagctcagg gcagagtctt
180

gcctggnaag cccggatgcn ttgaggcctt gaccacccnc agcacanana naaaatgaag
240

gaagacccaa ggnaccttct ggaagacctc atccccaaan aagcaagtg
289

<210> 282
<211> 250
<212> DNA
<213> Rattus norvegicus

<400> 282

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caatatggct tctgcaaggc gactctcatc cacagacttg gtggggaaga ggtttcagtg
120

gcctgcgcct gtagccccac cagctggccc acctgaatcc gtggtggtag gacccgtggc
180

agttcctcta ggacttccag accaccgaac ccaccatgac ctacggcatg ccttctctcc
240

tgtggcttct
250

<210> 283
<211> 285
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 283

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tgcannaanc ggtcncaaaa gattcnaann caagatggna gcccncnacg aacaggncat
120

tgtgaatgtn cttaaggaag aacaggtncc ccanaacaan atnaaagttg ttgggggtgg
180

tgtgntggca ngggttgtgc catcagnanc tcaangaang actgggtgat gagntgcccc
240

ttgttgatgn cacacaagan aanctaaacn gagagangan cgatc
285

<210> 284
<211> 266
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 284

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cagcttttgc actttcnang tgacgatggn cntacagagg acccaatcct tgcttctgct
120

ctgttgctga ccctgctggg gttagggttg tacagccctc ctatggccaa gatagaatgt
180

accaacggtt ccttagacag catgtggacc ctgaggggac aggcggcagg acaactactg
240

caacgtgatg atgcagagac ggaggt
266

<210> 285
<211> 250
<212> DNA
<213> Rattus norvegicus

<400> 285

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actgcctgga gccaccttcc tttgggagac cttcctgcct cagctgtcgt cctgtgtcgt
120

cattcactaa agctcctgac gtcagattaa gcaagcagtg atgggttaca ttagagacaa
180

gccgcagaga taaggcctgt tgctgtttcg cagataatga tgagttttaa ttacccactg
240

gtttgtatgg
250

<210> 286
<211> 118
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations

<400> 286

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ccnntncaat agtggagtga gcacgtgccc cccacgtagc ccaaanactc ccccaggc
118

<210> 287
<211> 262
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 287

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cctcaatggg gtcatgcctc caacacagag ctttgccccc gaccccaagt atgtcagcag
120

caaagccctg cagaganaga gcagcgaagg gtctgccaag gccccctgca tcctgcccat
180

ncattgagaa tgggaagaag gtcagctcca gcnttattca cctactacct gagcggacgg
240

cancaccttg ncaaatatga gc
262

<210> 288
<211> 282
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 288

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60

ctngtcctgc tcctttnnnt tgctcagatt ctagagctgc caatcagctc cacaaggtgc
120

agggctgggt tttcgagaat tggctttnat gacccggaaa aaaanccntt nanctttgat
180

agccgtggac tacctcaata aacatcttct tcagggattc aggcagatct tgaatcagat
240

gacaaagtaa ggtgtggtct cggcggccct tcgganaggt gt
282

<210> 289
<211> 265
<212> DNA
<213> Rattus norvegicus

<400> 289

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cattgttgta aagggaattt tgagaggtga tgatgcccag gaagctgtta aacatggtgt
120

ggatgggatc ttagtgtcga atcatggggc acgacaactg gatggggtgc cagctactat
180

tgatgccctg ccagagatcg ttgaggctgt ggaagggaag gtagaagtct tcctggatgg
240

gggagtcagg aaaggcaccg atgtt
265

<210> 290
<211> 199
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 290

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acaaggatgt gagatacact ctggagagat cagagacaag cacaganact gtgtcncact
120

agtgncgttg cagtctnaac atctgtggag atcnanncan tggtanntna ctggcncgan
180

ncgtncnatg caaannacg
199

<210> 291
<211> 285
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 291

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agtgtgatct tgttcaacta cagttatgga gaagcaactc attggccagn ttctgggaga
120

ntttgtgnng tanttaatgc agcngtatgg naacnnaata cnatttangt ttcnggtgct
180

gntantaatg gtcnatgcct tctacagtgg gttgtccann nggantactt ccancgnnat
240

aggngntgga gcntatgttc tcgccgatat ganggttgcn gngta
285

<210> 292
<211> 268
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 292

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ctgcgcaggg cacctctcta ctgtccagta ctaccaaggg ctgtatgaaa cactagaatt
120

ggctgaggac atggaaatcg acatccctca tgtatggctt tacctggcag aactgataac
180

acctattctt caggaagacg gggtacccat gggagagctc tttagggaaa ttacgaagcc
240

tctgagaccc atgggcaaag ccacttct
268

<210> 293
<211> 185
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 293

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cccttcatga agggcgatgg gtctgctgag gacttcatcc nagaaaggga aggacntcaa
120

gggggtntnn gaatncngcn nnnanggaag aaantnnaac tcnccatcan ctanggncc
180

aangt
185

<210> 294

<211> 286
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 294

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ttaataagat gttctatttt ctggtatgat ataaaattat ctctacttaa tgtcataact
120

ggcaaaaaaa aaactatcat tgcaaatgcc tcccagtgaa accaataact tctcanatat
180

ttagaattat tggttataac tcactaacct agtttcctaa natcanttta anatttgatt
240

tatngtanag cantggnnaa tgatgccnct ctnatgttgt ttnnac
286

<210> 295
<211> 225
<212> DNA
<213> Rattus norvegicus

<400> 295

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ggtgccatgc agccccgaat gctcctcatc gtggccctcg tggctctcct ggcctctgcc
120

cgagctgatg agggagaggg atccttgctg ctgggctcta tgcagggcta catggaacaa
180

gcctccaaga cggtccagga tgcactaagc agcatgcagg agtct
225

<210> 296
<211> 278
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 296

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nttccatcaa ntatcanaca naaattgaca agccatccca natgcangtg acggntgtcc
120

aggacaacag catcagtgtc aggtggctgc cttcaattct nctgtggaca ggtaccgagg
180

nccagcggtt ccncaaaant gggtactgac naacanaatc tcaaactgtc nagtccagat
240

canacagaga tgnccattga aggntgcaac ccaccgtg
278

<210> 297
<211> 290
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 297

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agagaagttc gaggtggana ggaaacctca ttgccaccat gaacttctcc ggcaagtacc
120

aagtgcagag ccaagagaac tttgagccct tcatgaaggn nannggnctg nctnaggnct
180

tcatncngaa angganggnc atcaaggggg tgtcagntat nctgcatgan ggganctcnt
240

caaatnanca ncactatgng tncaagtgat cnaatgagtt cacttggggc
290

<210> 298
<211> 296
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 298

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60

gcccagttga ggttaatcga agtctcgtcg caggctctgc tgtaagtctg gcctcttggc
120

ctcacatctt ctttgtggga tccttcccta tctccagctt cctcagctgg tcagggagat
180

ttggtccaga actagaagcc ttaataatct gagcaggtaa gagaggagta aaatgtacag
240

tcttggacat tgactaaagg gtcctgcaga ggatatcaag gtaagtggct tggagg
296

<210> 299
<211> 277
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 299

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gtcccctccg gctgcttggg aaacggagcc ttccagaagg ggtggtggat gcattgagat 120

ctacagcacc aagatcagct gcaaggtgac ctcccgcttt gctcacaatg ttgtcaccac 180

aagggctgtc aaccgtgcag acaaggccaa gaagtttcct ttgatgtgga ctgcccaaga 240

cagcctncat caccaacttc accttgatat ngatggg 277

<210> 300
<211> 287
<212> DNA
<213> Rattus norvegicus

<400> 300

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aaccatgaag gtagcaatta tctttcttct cagtggcttt ggccctgctc aatttagcag 120

gtaacactac agctaaggtg attgggaaaa aggctaattg ccctaataca cttgttggat 180

gccccaggga ttatgatcct gtgtgtggta ctgacggaaa aacttacgcc aatgaatgca 240

ttctatgctt tgaaaacagg aaatttggaa catctatccg cattcag 287

<210> 301
<211> 85
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 301

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60

gcccaggatg ttcctgaaag ggctg
85

<210> 302
<211> 295
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 302

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ccaacccagt gaggagccca ggatgtnccn gaaggctgtg gtgctgaccg tggccctggt
120

ggccatcacc gggacccagg ctgaggtcac ttccgaccng gtggccaatg tgatgtggga
180

ctacttcacc cagcnaagca acaatgccaa ggaggctgtg gaacaactgc agaagacaga
240

tgtcactcaa cagctcaata ccctcttcca ggacaaactt ggaacattaa cacct
295

<210> 303
<211> 279
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 303

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aggtgacaac cagggcatcc cgatcatgtc caacataaag ctgagagaag aacagcgcat
120

aaccacaact tccccctgga tgtttccagc tcaccacgtg tggcctgaag accacgtgtt
180

catttccaca ccaaacttca cnacacaggc caagacttcg agcgtttttt tgcagatctt
240

cattttgaag aaggctggca catgtttcta cagtctcgt
279

<210> 304
<211> 306

<212> DNA
<213> Rattus norvegicus

<400> 304

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60

tgcttcccga tactgggctg agtgccggca gtacagtgtg acagtggtcc tgtatgtggg
120

tgaagtcctg cgatacttgt gtaatgtccc agggcaacca gaagacaaga aacatacagt
180

gcggttcgca ttgggcaatg gacttcgggc agacgtgtgg gaaaacttcc agcaacgatt
240

tggtcccatt cagatctggg aactctacgg ctccacagag ggcaacgtgg gcttaatgaa
300

tatggg
306

<210> 305
<211> 296
<212> DNA
<213> Rattus norvegicus

<400> 305

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ggccttcctg ctcagtctat ttctggtgct gttcaaggca gtccaattct acttacgaag
120

gcaatggctg ctcaaggccc tcgagaagtt cccatccacg ccttcccact ggctttgggg
180

ccacgacctg aaggacagag aattccagca ggttcttacg tgggtagaga aattcccagg
240

tgcctgctta cagtggctct cagggagcaa aacacgagtc ctgctctatg accctg
296

<210> 306
<211> 147
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 306

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60

tcncctgctt catcctnagc ttggccagca cagtctggac tgcagacacc ggcaccacaa
120

ttgaattcat anaagcagga ggnnata
147

<210> 307
<211> 312
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 307

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60

ctctcggtcc aatgagctgc accaggatga tccacgtgct ggatccacga cctttgacaa
120

gttcagtcat gcccgtggac atggccatga ggatttgctt ggcacattca ccacccctga
180

agagtttcct gggtccttac aatggtcttc agcgaagaca ttttgtgaat aaaccgaagc
240

ccttgaaacc gtgtctcagc gtcaagcagg aagccaaatc acagaaggaa tggaagagcc
300

cacacagcca ag
312

<210> 308
<211> 284
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 308

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60

cagggggcag tcacccccaa ataacatctc cctcctgcag caggcctggc ccccctcagt
120

gtcttcctgt cagtttcttt atagtcattt tcctacaacc tattagccca aagaaactgg
180

gctggaggga agacttcaga ctggacggag cacccgttca gagtcagaag cggataanta
240

gctagagggg tcctccncat cagaatacta aagggtctcc agag
284

<210> 309
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<213> Rattus norvegicus

<400> 309

gtagccactc taactagggg cgtgctgaga caagaccacc tcattcctct gctgcttttc
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agacaggact gtcctgccga cccaccatga tccaggctgc actgttcctt ggctgtatct
120

tactgtcctc ggtgaccgcc tttccatgga agactcagga tggtggcctg ccccatcagc
180

cagctggcac agaaactgag cctacacaac tgctctacag caagagtcct cctccgacct
240

ccagtacctg tcggaacctc ctaagcatgg cgcccctgcc ccctgtagtc ctc
293

<210> 310
<211> 208
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 310

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gtccctctgc ttgtcttctn caagccatnt ggctctacct gctggcactg gtgggcctgt
120

ggaacctcct gcgcttgttc agggagngga nngtggtnag cnatctccaa gacaagtatg
180

tcttcatcac gggctgtgat caggcttt
208

<210> 311
<211> 280
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 311

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gctccctcct gccaccnnct tctggctcct caatgtgctc ttccccccgc acaccacgcc
120

caaggctgaa ctcagtaacc acacacggcc tgtcatcctc gtgcctggct gcatggggaa
180

ccggctagaa gccaagcttg ataaaccaaa tgtggtaaac tggctgtgct accgaaanac
240

agaggatttt ttaccacngn ctggattcan anntttcnnc
280

<210> 312
<211> 181
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 312

ctggaacact ttaattctgt ccacaagggc agagtgnacn aactcccagc aatctaggac
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tncaaccttt agcctttagc ctcactcctg agggttatgg tgatcaattt tcctggatct
120

gaagacttgg acatggactg agacctcagt tacagacagc ctgttgtgag acttctcagc
180

c
181

<210> 313
<211> 174
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 313

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ttgggattgc cnaaganaac tttgcaaaat gtttgtaata aagtttgtgg tgaaanacga
120

agatttgatt tcattggctt atcccaagtc aggaacgacg cgccggctcg naat
174

<210> 314
<211> 289
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 314

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ctggtggtgg ctatttgctc caggcctaac cagtggggaa gtggatttgc gggacacgtg
120

tctcagcctg gacacttagg ggttcttagc ttgtgaagcc aatccnggtg gaaccgatgt
180

ggatnaggnt gcantgnnnc tctgtttccc cccaaacttc cccagtaacc tttgggcaag
240

gtggatgaac ncagngattt ttgaaaagtc aaaaacttcg gtttgttta
289

<210> 315
<211> 309
<212> DNA
<213> Rattus norvegicus

<400> 315

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gggagcgaag tagggtctgc cagccccgag gagcaacttg acggatcagc cagcccagtg
120

gagatgcagg atgagggatc agaggagctt cacgagacag gagagcccct gccccccttc
180

ctgctgaagg agggtggaga tgaggggcta cactcggcag agcaggatgc cgatgatgag
240

gcagctgatg atacagatga caccagctcg gtgacctcct ctgccagtct accacctcct
300

ctcagagtg
309

<210> 316
<211> 211
<212> DNA
<213> Rattus norvegicus

<400> 316

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gcttctacct tggccacagc tcacccactc cgggcgtaga ggctctagga gctgccctgg
120

acgctgcacc ttctgaccca gtgcctgcca agcttcgtgc taatataaag tggaaatccc
180

cagccatatt catctatact tcagggacca c
211

<210> 317
<211> 282
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 317

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60

cgttttcacg ccccggctgc agacagctag gaggctttat ctagtttgaa ccaggctgct
120

ggagctcgct ccttccctct ctttttttcc acgaggctgt tttttattt ggctgcatgc
180

atgaaatccc aatggtgtag accagtggcg atggatctag gagtttacca actgagacat
240

ttttcaattt ctttcttgtc gtctttgctg ggaatgaaaa cg
282

<210> 318
<211> 261
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 318

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catggttaaa ctgctttaat ttacactttt gattgggtgc tggggaataa acctaaagca
120

tggcatatta atgaagaaca tatggtaacc atgaactcca tctctggatt cctttatcgg
180

cnatttttta aaggttgaat attcgcacca gagaatgaca agtggttttg acaacatact
240

ctaggccttc tattaaaaac a
261

<210> 319

<211> 273
<212> DNA
<213> Rattus norvegicus

<400> 319

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ttcttgttac tcttagtcag gggacaccca aagtcccgtg gcaacttccc accaggacct
120

cgtccccttc ccctcttggg gaacctcctg cagttggaca gagggggcct cctcaattcc
180

ttcatgcagc ttcgagaaaa atatggagat gtgttcacag tacacctggg accaaggcct
240

gtggtcatgc tatgtgggac agacaccata aag
273

<210> 320
<211> 205
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 320

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60

cttagtcagg ggacaccnaa attccntggg aaatttccna caagnacttg nncccttcc
120

cntntngggg aacncntgaa nttggaaana ggaggcntcc tnantncntt cangnagttt
180

cgcgaaaaat atgganatgt ntnca
205

<210> 321
<211> 289
<212> DNA
<213> Rattus norvegicus

<400> 321

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actcttagtc aggggacacc caaagtcccg tggcaacttc ccaccaggac ctcgtcccct
120

tcccctcttg gggaacctcc tgcagttgga cagaggaggc ctcctcaatt ccttcatgca
180

gtttcgcgaa aaatatggag atgtgttcac agtacacctg ggaccaaggc ctgtggtcat
240

gctatgtggg acagacacca taaaggaggc tctggtgggc caagctgaa
289

<210> 322
<211> 265
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 322

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ctccaacgta ccagatctgc ttctcagctc ggtgatccgg ctgaggcagc catgtgcccc
120

agttctgttg ggaatggcct catgtttctg cctctggggg acctgctgaa aaccaggctc
180

aaggccactg ctcacatctt cctattgcag ttctccaaag tcccaaggct ttttcntatt
240

cctgtgaatg gcactgaaga agtca
265

<210> 323
<211> 234
<212> DNA
<213> Rattus norvegicus

<400> 323

gtaaaatgcc atacactgat gcagttatcc atgagattca gaggttttca gatcttgtcc
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ctattggagt accacacaga gtcaccaaag acaccatgtt ccgagggtac ctgcttccca
120

agaacactga agtgtacccc atcctgagtt cagctctcca tgacccacag tactttgacc
180

acccagacag cttcaatcct gaacacttcc tggatgccaa tggggcactg aaaa
234

<210> 324
<211> 235
<212> DNA

<213> Rattus norvegicus

<223> unsure at all n locations
<400> 324

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60

aaccacatag ctggctgaan gctgtgctct ttgggctcct gcttattctt atccatgtgt
120

ggggtcagga ctcaccagag tccagctcca tcaggaccac acaanatann attnanaaan
180

gnaagcttga cnacgtgagg gacactaaag ctggtgtcca nacaacanaa ngttc
235

<210> 325
<211> 263
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 325

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tattttgaca tgtgaacaga gatttcatga gtacacatct catgctgagt cacttccctc
120

ttcctcctaa tagcccacgt ccccacttat cagccctcca tggtctgtga tctgtgctaa
180

tggactctgt atatggtctc agtgctatgt ctacagactt acatagtatg tatggttcag
240

gtaaacagat cacagagtgt gtg
263

<210> 326
<211> 300
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 326

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aacaggaact gatacacgag ccaaaccagc aatgtcttcc cctgcacagc ctgcagttcc
120

tgccccactg gccaacttga agattcaaca caccaagatc ttnataaaca atgaatggca
180

tgattcagtg atggcaagna attacctgtc cttaaccctg caatgaggag gtcatctgac
240

atgtggaaga agggacaagg cagatgttga caagctgtga agccgcaaga caggctttcc
300

<210> 327
<211> 350
<212> DNA
<213> Rattus norvegicus

<400> 327

attggtgtta acacagatga gtactgttgc accattccta tggtcatggg cactgctcaa
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ataataaagg agctatccag agagaacctg caggctgttc taaaggatac agcagcacaa
120

atgatgcttc ctcctgagtg tggtgacctg ctcatggaag agtacatggg gaacactgat
180

gattcccaga ccctacaaat acagtacaca gagatgatgg gagacttcct gtttgtgatc
240

cctgcactcc aagtagcaca ctttcagcgt tcccatgccc ctgtctactt ctatgagttc
300

caacatgcac ccagctattc aagaatgtca ggccacccca gtgaaggtga
350

<210> 328
<211> 258
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 328

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60

agggccctca gattnacaag gagcaacatg ataaaatcct tgatctcant gagagtggga
120

agaangaagg agccaanctn gagtgtggtn taggacgcng ggggnacaaa ggcttcnttg
180

tccanccenn agtcatctcc aatgtgacng atgagatgng cattnccnaa gaggngatat
240

ttggancagn gcaacaaa
258

<210> 329
<211> 245
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 329

gaaatgatgt ggccaggttc atcaactggt tggaggnaga atttaactac cccctagaca
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atgtccacct cttagggtac agtcttggag cccatgctgc tggcgtggca ggaagtctga
120

ccaacagaag gtcaatagaa ttactggctt ggatccagct gggcctaact ttgagtatgc
180

agaagcccct agtcgccttt ctcctgatga tgcggatttc gtagatgtct tacacacatt
240

tacca
245

<210> 330
<211> 191
<212> DNA
<213> Rattus norvegicus

<400> 330

gattatttgt agccaccatg agagactttg ggataggaaa gcagagtgtg gaggatcaga
60

taaaggagga ggccaaatgt ttagtggagg aactgaagaa tcatcaggga gtctccctgg
120

acccaacgtt cctcttccag tgcgtcacag gcaacataat ctgctccatt gtctttggag
180

agcgctttga c
191

<210> 331
<211> 265
<212> DNA
<213> Rattus norvegicus

<400> 331

aggaagccct gcagagcatc agaggcccag ctagagggac aacacagagg agtaatttgc
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tgacagacct gcagggatgg acctgctttc agctctcaca ctggaaacct gggtcctcct
120

ggcagtcgtc ctggtgctcc tctacggatt tgggacccgc acacatggac ttttcaagaa
180

acaggggatt cctgggccca aacctctgcc ttttttggc actgtgctga attactatat
240

gggtttatgg aaattcgatg tggag
265

<210> 332
<211> 296
<212> DNA
<213> Rattus norvegicus

<400> 332

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caccatgtcg caagcccggc ctgccactgt gctgggtgcc atggagatgg gtcgccgcat
120

ggatgtgacc tccagctccg cgtcggtgcg cgccttcctg cagcgcggcc acacggagat
180

agacaccgcc ttcgtgtatg cgaacggtca gtctgagacc atcctaggag acctggggct
240

cggactgggc cgcagcggct gcaaagtaaa aattgccacc aaggctgccc caatgt
296

<210> 333
<211> 214
<212> DNA
<213> Rattus norvegicus

<400> 333

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aaaggcaaac ctgtccctgt gaaagaagtg tttggtgcct acagcatgga tgtgatcacc
120

agcacatcat ttggagtgaa tgttgattcc ctcaacaacc cgaaggatcc ttttgtggag
180

aaagccaaga agctcttaag aattgatttt tttg
214

<210> 334
<211> 183
<212> DNA
<213> Rattus norvegicus

<400> 334

ggcagcattg atccttatgt atatctgccc tttggaaatg gacccaggaa ctgcattggc
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atgaggtttg ctctcatgaa tatgaaactc gctctcacta aagttctgca aaacttctcc
120

ttccagcctt gtaaggaaac acagatacct ctgaaattaa gcagacaagg acttcttcaa
180

cca
183

<210> 335
<211> 174
<212> DNA
<213> Rattus norvegicus

<400> 335

attggcacca aggagggaat cctgcagtac tgccaagagg tctaccctga actgcagatc
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acaaacgtgg tggaagccaa ccagccagtg accatccaga actggtgcaa gcggggccgc
120

aagcagtgca agacgcacac ccacatcgtg attcttaccg gtgcctagtt ggtg
174

<210> 336
<211> 241
<212> DNA
<213> Rattus norvegicus

<400> 336

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tggaggaact gaggaaaacc aatggctcac cctgtgaccc cacgtttatc ctgggctgtg
120

ctccttgcaa tgtcatctgc tccattattt tccagaatcg ttttgattat aaagatcagg
180

attttcttaa cttgatggaa aaactcaatg agaacatgaa gattttgagc agtccctgga
240

c
241

<210> 337
<211> 289
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 337

atgaaggtct ttgtgcccac tggcttttca gccttccctt ccgagctact gcatgcccca
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gaaaaagtgg gtgaaggtca agtaccccaa actcatctcc tattcctaca tggaacgtgg
120

gggccacttt gctgcctttg aagagcccaa gcttctggcc aggacatccg caagttcgtg
180

tccctggctg agctgnagta ntnacggntt annaaantgt ggctttagna naancctggt
240

tccccanagn aannttgggn aacccccctn gggaaaaant tntcccccc
289

<210> 338
<211> 243
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 338

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gtaatttgct gacagacctg cagggatgga cctgctttca gctctcacac tggaaacctg
120

ggtcctcctg gcagtcgtcc tggtgctcct ctacggattt gggacccgca cacatggact
180

tttcaagaaa caggggattc ctgggcccaa acctctgcct ttttttggca ctgtgctgaa
240

tta
243

<210> 339
<211> 289
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 339

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atttgctgaa cagacctgca gggatggacc tgctttcagc tctcacactg gaaacctggg
120

tcctcctggc agtcgtcctg gtgctcctct acggatttgg gacccgcaca catggacttt
180

ncaagaaaca ggggattcct gggcccaaac ctctgccttt ntttggcatg tgctgaattn
240

ctatatgggt ttatggaaat tcgatgtgga gtgccataaa aagtatgga
289

<210> 340
<211> 289
<212> DNA
<213> Rattus norvegicus

<400> 340

atttaaggtg atctatctca tcagaaatcc cagagatgtt cttgtttctg gttattattt
60

ctggggtaag acaactcttg cgaagaagcc agactcactg ggaacgtatg ttgaatggtt
120

cctcaaagga aatgttccgt atggatcatg gtttgagcac atccgtgcct ggctgtctat
180

gcgagaatta gacaacttct tgttactgta ctatgaagac atgaaaaagg atacaatggg
240

aaccataaag aagatatgtg acttcctggg gaaaaaatta gagccagat
289

<210> 341
<211> 278
<212> DNA
<213> Rattus norvegicus

<400> 341

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cttgagagag tctgtaaaaa agatgttgaa atcaatggtg tgtttatgcc caaagggtca
120

gtggtcatga ttccatctta tgctcttcac cgtgatccac agcactggcc agagcctgag
180

gaatttcgcc cagaaaggtt cagcaaggag aacaagggca gcattgatcc ttatgtatat
240

ctgccctttg gaaatggacc caggaactgc attggcat
278

<210> 342
<211> 312
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 342

cggtcggtac cggagagcgc aggttgtatc accaacatgg gggactctca cgaagacacc
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agtgccacca tgcctgangc cgtggctgaa gaagtgtctc tattcagcac gacggacatg
120

gttctgtttt ctctcatcgt gggggtcctg acctactggt tcatctttag aaagaagaaa
180

gaagagatac cggagttcag caagatccaa acaacggccc cacccgtcaa agagagcagc
240

ttcgtggaaa agatgaagaa aacgggaagg aacattatcg tattctatgg ctcccagacg
300

ggaaccgctg ag
312

<210> 343
<211> 287
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 343

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ggcgccgtga ctccgggcgc tgtggaccat ggctccgccc caggcgccca acagggaccg
120

tgcangccag gaggatgagg accgttggga acacgggggg accgcaaggc ccggaagccc
180

ctggtggaga agaagcgacg cgcgcggatc aacgagagtc ttcaggagtt gcggctgctg
240

ctagcgggca ccgngtgcag gccaagctag agaacgccga ggtgctg
287

<210> 344
<211> 232
<212> DNA
<213> Rattus norvegicus

<400> 344

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60

ggacttcctg gcccgctttg agggcctgaa gaagatctct gcctacatga attgcagccg
120

ctacctctca acacctatat tttcgaagtt ggcccaatgg agtaacaagt aggcccttgc
180

tacactggca ctcacagaga ggacctgtcc acattggatc ctgcaggcac cc
232

<210> 345
<211> 223
<212> DNA
<213> Rattus norvegicus

<400> 345

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tggatctttt attcatgagc aattcagccc caaaatgaat ttggaaaact tttgcctgaa
120

gtacttattg aaatacaatc aagagacctg ctgaatattt tgatgcgttc tcaaaagtgt
180

atggtcctgt atttactctt tactttggca tgaagcccac tgt
223

<210> 346
<211> 278
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 346

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60

gatcctgcag gcaccctggc cttctgcact gtggttctct ctccttcctg ctcccttctc
120

cagctttgtc agccccatct cctcaacctc accccagtca tgcccacata gtcttcattc
180

tccccacttt ctttcatagt ggnccccttc tttattgaca ccttaacaca acctcacagt
240

ccttttctgt gattgaggtc tgccctgaac tcagtctc
278

<210> 347
<211> 295
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 347

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60

actctcacga agacaccagt gccaccatgc ctgaggccgt ggctgaagaa gtgtctctat
120

tcagcacgac ggacatggtt ctgttttctc tcatcgtggg ggtcctgacc tactggttca
180

tctttagaaa gaagaaagaa gagataccgg agttcagcaa gatccaaaca acggccccac
240

ccgtcaaaga gagcagcttc gtggaaaaga tgaagaaaac gggaangaac ttatc
295

<210> 348
<211> 230
<212> DNA
<213> Rattus norvegicus

<400> 348

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ctggttgtct ctgttaattt cttttgatag taaccttgtc tctgtaattt gatcaagaat
120

ttttcatgaa aatgtgaact attgtgacaa ctttaattgt agatttggta tcagatgttt
180

tagatgcatt attctacact aaatgttaca tggaaaaaat gtgaataaac
230

<210> 349
<211> 282
<212> DNA

<213> Rattus norvegicus

<223> unsure at all n locations
<400> 349

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ggtcggttta gcgtcctccg ctcgngtgcc caccgccgtc tcgtcgagag cccgcgcagg
120

acccgggaca ctttgcagac atggagactg tcgttcgcag atgcccattc ttatcccgag
180

tccctcaggc ntttctgcag aaggcaggga aatctctgct gttctatgct caaaactgcc
240

ccaagatgat ggaagtcggg gccaagccgg ctcctcggac cg
282

<210> 350
<211> 280
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 350

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ccgccatggg tctggagctt ctacctggac ctgatgtccc agcnntgccg tgccgtctac
120

atcttcgcca agaagaacgg catccccttc cagctgcgta ccatcgagct gcttaaaggt
180

cagcattaca ctgatgcctt tgcccaggtg nacccttga ggaaggtgcc ggctttgaag
240

gatggggact tcgtcttggc agagagtgtg ccatcttgct
280

<210> 351
<211> 309
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 351

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ctttgactga nacgaagacc actgtggagc tccttcccgt gaatggcgaa ttcagcctgg
120

atgatctcca accgtggcat ccttttgggg tggactctgt gccagccaat acagaaaatg
180

aagggtctgg gttgacaaac atcaagacag aagagatctc agaagtgaag atggatgcgg
240

agttcggaca tgattcangc ttcgaatccg ccatcaaaaa ctggtggtct tgcagaagng
300

tgggtcaaa
309

<210> 352
<211> 228
<212> DNA
<213> Rattus norvegicus

<400> 352

gctggctgca aaatcttcga gagccgaccc aaactggctg cgtggcgtca gcgggtggaa
60

gccgcagtgg gggagagcct cttccaggag gcccatgaag tcgtcctgaa ggccaaagat
120

atgcctccct tgatggaccc gaccttgaag gagaaactga agctctctgt tcaatgcctg
180

ctgcactgag ggaacagcct gaagtcaagg gaaacttggt gtgtgcgt
228

<210> 353
<211> 298
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 353

caggatcatg gatactagtg tccttctcct ccttgctgtc ctcctcagct tcttgctatt
60

cctggtcaga ggccatgcaa aagttcatgg tcatcttcca ccaggacccc gtcccttacc
120

cctcttggga aacctcttgc agatggacag aggaggcttt cgtaagtctt tcattcagct
180

tcaagaaaaa cacggagatg tgttcacagt atactttgga cctaggcctg tggtcatgct
240

gtgtgggaca cagaccataa gggaggctct ggtggacatg ctgaggnttc tctggcgg
298

<210> 354
<211> 326
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 354

gacaaaatcc cagaataagg aaactctgaa ccaggagtca tggaagtcaa acccaagctc
60

tactactttc aaggcagggg aaggatggag tcgatccgct ggctgctggc tacagctgga
120

gtggagtttg aagaagaatt tcttgagacg agagaacaat atgagaagtt gcaaaaggat
180

ggatgcctgc tttttggcca agtcccattg gtggaaatag acgggatgct actgacacag
240

accagagcca tcctcagcta cctggccgcc aagtacaact tgtatgggaa ggacctgaan
300

gagagagtca ggattgacat gtatgc
326

<210> 355
<211> 274
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 355

tccttctcct ccttgctgtc ctcctcagct tcttgctatt cctggtcaga ggccatgcaa
60

aagttcatgg tcatcttcca ccaggacccc gtcccntacc cctcttggga aaacnctttg
120

aagaatggac agaggaggct ttgtaagtct ttcattnagc ttcaagaaaa acacggagat
180

gtgttcacaa gtatacttgg aactaggcct gtggtcatgc tgtgtgggac acagaccata
240

agggaggctc tggtggacat gctgangctt ctct
274

<210> 356
<211> 148

<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 356

cggccccact gcctcagaga cctacaggac cgcgggncgt gggtgatctg gtcggtaccg 60

gagagcgcag gttgtatcac caacatgggg gactctcacg aagacaccag tgccaccatg 120

cctgaggccg tggctgaaga agtgtctc 148

<210> 357
<211> 302
<212> DNA
<213> Rattus norvegicus

<400> 357

ttagatctga ctgaaatgat tatccaattg gtaatatgtc ccccagacca aagagaagcc 60

aagaccgcct tggcaaaaga caggaccaaa aaccggtact tgcctgcctt tgaaaaggtg 120

ttgaagagcc atggccaaga ctaccttgta ggtaacaggc tgacccgggt agacatccac 180

ctgctggaac ttctcctcta tgttgaagag tttgatgcca gccttctgac ctctttccct 240

ctgctgaagg ccttcaagag cagaatcagc agcctcccca atgtgaagaa gttcctgcag 300

cc 302

<210> 358
<211> 286
<212> DNA
<213> Rattus norvegicus

<400> 358

cggaagtgaa ccaaggcact gagcggcatc taatgcacct ggagttggac atctcagact 60

ccaagatcag gtatgaatct ggagatcacg tggctgtgta cccagccaat gactcagccc 120

tggtcaacca gattggggag atcctgggag ctgacctgga tgtcatcatg tctctaaaca 180

atctcgatga ggagtcaaac aagaagcatc cgttcccctg ccccaccacc taccgcacgg
240

ccctcaccta ctacctggac atcactaacc cgccacgcac caatgt
286

<210> 359
<211> 320
<212> DNA
<213> Rattus norvegicus

<400> 359

caagttcctg cagaacaagg ccttcctaac aggaccccat atctccgtgg ctgacttggt
60

ggccatcaca gaactgatgc atcctgtcag tgctggctgc aaaatcttcg agagccgacc
120

caaactggct gcgtggcgtc aggggtggaa gccgcagtgg gggagagcct cttccaggag
180

gcccatgaag tcgtcctgaa ggccaaagat atgcctccct tgatggaccc gaccttgaag
240

gagaaactga agtctctgtt caatgctgct gcatgaggga acagcctgaa gtcaagggaa
300

acttgtgtgt gcgtgtgtgt
320

<210> 360
<211> 288
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 360

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60

cttcccacag cctccgccat gggtctggag ntctacctgg actgatgtcc cagccctgcc
120

gtgccgtcta catcttcgcn aagaagaacg gcatcccttc cagctgcgta ccatcgagct
180

gcttaaaggt cagcattaca tgatgcnttg cncaggtgaa cntttgngga aggtgccggc
240

nttgaagcng gagattcgtc ttgccaanna tgtggcancn tgctgtat
288

<210> 361
<211> 272
<212> DNA
<213> Rattus norvegicus

<400> 361

gaactctgct caacagcctc tttctctagt tcctgcagac aaaatcccag aataaggaaa 60

ctctgaacca ggagtcatgg aagtcaaacc caagctctac tactttcaag gcaggggaag 120

gatggagtcg atccgctggc tgctggctac agctggagtg gagtttgaag aagaatttct 180

tgagacgaga gaacaatatg agaagttgca aaaggatgga tgcctgcttt ttggccaagt 240

cccattggtg gaaatagacg ggatgctact ga 272

<210> 362
<211> 286
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 362

ggcccatgga gcacacccag gctgtggact atgttaagaa gctgatgacc aagggccgct 60

actcactaga tgtgtggagt aggagctacc accctcccac ccctcgctcc ctgtaatcac 120

ctaacttctg ccgacctcca cctctggtgg ttcctgcctg gcctggacac agggaggccc 180

agggactgac tcctggcctg agtngtgccc tcctgggccc ctaagcagag tccggtccat 240

tgtatcaggc agcccagccc caaggcacat ggcaagaggg attgac 286

<210> 363
<211> 288
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 363

gtaaaagang ccttgattga tcatggggag gagtttgctg aaagaggaag cttcccagta
60

gctgaaaaaa ttaataaaga ccttggaatt gtttttagcc atggaaatag atggaaagaa
120

ataagacgct taccctcacg actctgcgga atttgggcat gggganaagg aacattgagg
180

ntcgtgttca anaggcaanc ccggnancct nggggaggac ctgnggaaan ccatggggcn
240

caccgtgnna ccccangtnt atccctgggc tgngcncctt gnannacc
288

<210> 364
<211> 237
<212> DNA
<213> Rattus norvegicus

<400> 364

tcacagctaa agtccaggaa gagattgatc gtgtggttgg caaacatcgc agcccttgca
60

tgcaggacag gagccgcatg ccctacacag atgccatgat tcatgaggtc cagaggttca
120

ttgacctcat tcctaccaac ctgccacatg cggtgacctg tgacattaag ttcaggaact
180

acctaatacc caagggaaca acaataataa catcactctc atcagtgctg catgaca
237

<210> 365
<211> 304
<212> DNA
<213> Rattus norvegicus

<400> 365

ggagaatgga gcccatccgg tggctcctgg ctgcagctgg agtagagttt gaagaacaat
60

ttctgaaaac tcgggatgac ctggccaggc taaggaatga tgggagtttg atgttccagc
120

aagtgcccat ggtggagatt gatgggatga agctggtgca gaccagagcc attctcaact
180

acattgccac caaatacaac ctctatggga aggacatgaa ggagagagcc ctcatcgaca
240

tgtatgcaga aggagtggcg gatctggatg aaatagttct ccattaccct tacattcccc
300

ctgg
304

<210> 366
<211> 218
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 366

ggcactggtc ggtttagcgt cctccgctcg agtgcccacc gncgtctcgt acgagagccc
60

gcgcaggacc cggcgacact ntgcagacnt ggagactgtc gtttcgcaga tgcccattct
120

tatcccgagt ccctcaggcn tttctgcaga aggcagggaa atctctgctg ttctatgctc
180

aaaactgccc caagatgatg gaatcggggc naanccgg
218

<210> 367
<211> 269
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 367

ggtcnccatg gatctggtca ctttcctggt acttactctc tcctctctca ttctcctctc
60

actctggaga nagnnccgct aggagaagga agctcnctcc tggccccact cctctcccna
120

ttatcggtaa tttccctccn gatagatgtg aagaacatca gccaatccta accaagtttt
180

caaaaaccta tggccctgtg ttcactctgt atttgggctc acagcccnct gtcatattgc
240

atggatntga agcnataaag gagctctgt
269

<210> 368
<211> 270
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 368

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cagatctttg tgaaaacctt aactggtaag accatcaccc tggaggtcga gcccagtgac 120

accattgaaa atgtcaaggc aaagatccag gacaaggagg gcatcccccc tgaccagcag 180

aggctgatct ttgcaggcaa gcagctggaa gatggccgca ccctgttcag actacaacat 240

ccagaaggag tccaccntgc acctggtcct 270

<210> 369
<211> 238
<212> DNA
<213> Rattus norvegicus

<400> 369

ggaagcaatg attctaggtg tgtttctggg gctttttcta acatgtctgc ttctcctttc 60

actgtggaag cagaattttc agagaagaaa ccttcctcct ggccccacac ctcttcctat 120

cattggaaat attcttcaga tagatcttaa ggacatcagc aaatctctga ggaatttttc 180

aaaagtctat ggccctgtgt tcaccctgta ctttggcagg aagcctgctg tggtgtta 238

<210> 370
<211> 260
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 370

aaaggaccag ttctgtattg gtggttagta ggctacgttg tcatggtggc ctctggcaac 60

ccaggtacct gaaaaccagt ttcagggaca gcagtggaga acatactcta ggcaaacata 120

ctggcctgtt tccattataa caagatacct aaggccaact actttnttta ccaagagaag 180

aggtttgtta cagcacaaga tgaggtggcc ccgtcgttag cccttggagg gccatgtgga 240

aaataacacg tggtgaggga
260

<210> 371
<211> 283
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 371

cgcgcgtccc ttaccccgtt ggctgcggcg atgcgtacga tgagctggat ggcctcggtc
60

atgtagaagc gaccgtccnc gcccacaacc agcgtggcct cctgcctcaa cgccggctcc
120

acggtggaga cgatgctttg gatgaaattc tccgcatagt tagcgttgcc ctggaacacc
180

tncactcgct tccgcaaccc gctggtgccc ggcttctgat ccggntatgc ctgcgtcttc
240

actgtcacga tcttcaccat ggtggccggg gctgcgnggc gac
283

<210> 372
<211> 273
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 372

gaaaagttca tgcctatcgt ttacactncc acngngngtc ntgcatgnca gcaatacagt
60

tggcattccg gaagccaaga ngcctcttta tcagnatcca cganaaaggg natattgctt
120

cagttctgaa cgcatggcca gaagatgttg tnanngctat tgtggtgact gatgggatag
180

nggatcctnc ggntngggcg acctttgtnn tanngggtg ggcatncctg gggtgtaaag
240

ggtccctgna aacaggttng gggggtngat ccc
273

<210> 373
<211> 301
<212> DNA
<213> Rattus norvegicus

<400> 373

tacggaagta gttcccgctg cttatgccat ggtcctggaa ctgtacctgg atctgctgtc
60

gcagccctgt ccgcgctatt tatatcttcg ccaagaagaa caatatcccg ttccagatgc
120

atactgtgga gctgcgcaag ggtgagcacc tcagcgatgc ctttgcccag gtgaacccca
180

tgaagaaggt accagccatg aaggatggtg gcttcacctt gtgtgagagt gtggccatcc
240

tgctctacct ggcgcacaag tataaggttc ctgaccactg gtacccccaa gacctgcagg
300

c
301

<210> 374
<211> 309
<212> DNA
<213> Rattus norvegicus

<400> 374

gggtctccat ggatctggtc actttcctgg tacttactct ctcctctctc attctcctct
60

cactctggag acagagctct aggagaagga agctccctcc tggccccact cctctcccaa
120

ttattggtaa tttcctccag atagatgtga agaacatcag ccaatcctta accaagtttt
180

caaaaaccta tggccctgtg ttcactctgt atttgggctc acagcccact gtcatattgc
240

atggatatga agcaataaag gaagctctga ttgataacgg ggagaagttt tctggtagag
300

gaagctatc
309

<210> 375
<211> 298
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 375

gtacccacat gtcacagcta aagtccagga agagattgac cgtgtgattg gcagacatcg
60

cagcccctgc atgcaggata gaaaacacat gccctacaca gatgccatga ttcatgaggt
120

acagagattc attaactttg tcccgaccaa cctgccccat gcagtgacct gtgacattaa
180

attcaggaac tacctcatcc cgaaggaaca aaagtgttaa catcactgac atcagtgctg
240

catgacagca aggagttccc naacccagag atgtttgacc ctggccactt tctagatg
298

<210> 376
<211> 234
<212> DNA
<213> Rattus norvegicus

<400> 376

cagacatcgc agcccctgca tgcaggatag aaaacacatg ccctacacag atgccatgat
60

tcatgaggga acaaaagtgt taacatcact gacatcagtg ctgcatgaca gcaaggagtt
120

ccccaaccca gagatgtttg accctggcca ctttctagat gagaatggaa actttaagaa
180

aagtgactac tttttgcctt tctcagcagg aaaacgagct tgtgttggag aggg
234

<210> 377
<211> 267
<212> DNA
<213> Rattus norvegicus

<400> 377

gtcctgacca ggctacgatc tggtacggcg gatgtctatt gtctatgcac taggcgcctg
60

gtcggtgctg ggctcggcga ttttccttac acgaaaaccg aagatgtcag actatgggga
120

aaatgaagag gatgactcaa gcaatgaaat gcctttttct acaagtgaag actctgattt
180

agcgatggaa agggctgagc ctattaaagg gttttatacg aagacaattg taaagtattc
240

agaaaattct gttccattac tcagagg
267

<210> 378
<211> 249
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 378

aatccggnag aggatccacc tgagacctga ggncgcctta ttcttctttg tcaacaacac
60

tatccctccc accagtgcta ccatgggaca gctgtatgag gacaaccatg aggaagacta
120

ttttctgtat gtggcctaca gtgatgaaag tgtctacggg aaatgaggca gaagcccagc
180

agatgggagc gcctggactt gggggtaggg gaggggtgcg tgtgggactt ggggaaccag
240

agggagggc
249

<210> 379
<211> 292
<212> DNA
<213> Rattus norvegicus

<400> 379

gaagggagct cagcacgttc agccctgcaa ggggcagtac acaaaattga gagtaaagct
60

cgaagagaga cttgtttaaa gaaaacggca atggatttga tcccaaactt ttccatggaa
120

acctggctgc tcctggttat cagcctggtg ctcctctacc tatatggaac tcattcacat
180

ggaattttta aaaagttggg aattcctggg cccaaacctt tgcctttctt ggggacgatt
240

ctgcttacag gaagggctct gggaattgac aaatactgcc ataaaaaata tg
292

<210> 380
<211> 168
<212> DNA
<213> Rattus norvegicus

<400> 380

ctagcccgta tggagttatt tttattcctg accacgattt tacaaaactt taagctgaaa
60

tctgtacttc acccaaagga tatcgataca actccagttt tcaatggatt tgcctctctg 120

ccaccatttt atgagctgtg cttcattcct ctctaaagag atcaaatt 168

<210> 381
<211> 298
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 381

accagtttct ggttccactc gcagagaagc agagaagcgg agnaagcggc gcgttccaga 60

acctncgggc aagaccagcc tctcccagag catccccacc gcgaaggcan accttctcca 120

gagcataccc cagcggagcg naccсttccc cagagcatcc ccgccgccaa gcgcaacctt 180

ccagaagcag agagcggcga catggccaag aaaacagcga tcggcatcga cctgggcacc 240

acctactcgt gcgtgggcgt gttccagcac ggcaaggtgg agatcatcgc caacgacc 298

<210> 382
<211> 297
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 382

ananaataga agaacaccag gaatcattgg atgttacaaa ccctcgtgat tttgttgatt 60

attacctgat taaacaaaaa caggcaaaca acatcgaaca atcagaatat tcacatgaaa 120

atctgacatg cagtatcatg gatctcattg gtgcagggac agagacaatg agcacaacat 180

tgagatatgc tctcctgctt ctgatgaagt acccacatgt cacagctaaa gtccaggaag 240

agattgaccg tgtgattggc agacatcgca gcccctgcat gcaggataga aaacaca 297

<210> 383
<211> 234

<212> DNA
<213> Rattus norvegicus

<400> 383

aacgcagccg ttctgcagc attgccatgt caggaatgat attgggaatc tttgctgtgc
60

tccttgtggg cggcatcatt agtgaagccc tcgggtggcc ctttgtcttt tatatctttg
120

gaagtattgg tgtggtctgc tgccttctct ggctcattct ggtttatgat gaccctgtct
180

ctcacccatg gataagtagc ccagaaaagg agtatatttt atcctccctg gacc
234

<210> 384
<211> 299
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 384

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60

tctgagcgtg aaccttagtc ccccgcgcgg ccccatttcc actccgacaa gatgaaagaa
120

acgatcatga accaggaaaa actcgccaaa ctgcaggcac aagtgcgcat tggtgggaaa
180

ggaactgctc gtagaaagaa gaaggtggtt cacagaacag ccacagcaga cgataaaaaa
240

ctgcagttct ccttaaagaa gttaggggta aacaatatct ctgtattgaa gaggtgaac
299

<210> 385
<211> 291
<212> DNA
<213> Rattus norvegicus

<400> 385

ctgacgttgt ctatagaaca gtggccaacc tttctggatg tgagcaggtg gactccaagg
60

ctctggtgaa ctgtctacga ggcaagagcg aggaagagat tatgtctatt aacaaggcct
120

tcaggatcat ctctggcata gtggatggta tcttccttcc cagacatccc aaggagctgt
180

tggcctctgc tgactttcac cccattccca gcattattgg tgtcaacaat gatgagtatg
240

gctggatcat tccctcgagc atgaccacca ctgactccaa gaagaaaatg g
291

<210> 386
<211> 304
<212> DNA
<213> Rattus norvegicus

<400> 386

actgagtgga cctgtgaaga atccaaattc caaacaattt tcaacatgga ttcccgtgaa
60

ttccggagaa gagggaagga gatggtggat tatatagctg actatctgga cggcattgag
120

ggacgtccag tgtaccctga cgtggagcct ggctaccttc gggccctgat ccccaccact
180

gccccccagg agccagaaac atatgaggac ataatcagag acattgaaaa gataatcatg
240

ccagggtcac acactggcac agcccctact tcttcgctta cttccccagg ccagctccta
300

ccca
304

<210> 387
<211> 264
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 387

gngcggagga agccgactgt tccggatctc tgcatagcag ggcccaacct ttgctccana
60

gatcatggct gccgaggatg tggtggcgac tggngncgac cccagcgagc tggagggcgg
120

cgggctgctt caanagatnt tcacgncgcn tctcaacctg ctgctccttg gccatgcatc
180

ttcctgctct acaagatcga tcgcngggac cagcccggtg ccaatgggga caacnactcc
240

gacgagnngn ccncgctgnc ncng
264

<210> 388
<211> 267
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 388

cggaacagtc gaggctagat tgacacagct gtccgttcag accccagcac catgcccatg
60

acactgggtt actggganat ccgtggggct agcgcatgcc atccgcctgc tcctggaata
120

cacagactcg agctatgagg agaagagata caccatggga gacgctcccg actttgacag
180

aagccagtgg ctgaatgaga agttcaaact gggcctggac ttccccaatc tgccctactt
240

aattgatgga tcacacaaga cacccag
267

<210> 389
<211> 307
<212> DNA
<213> Rattus norvegicus

<400> 389

gtgccctcac gcagcttaat gtggcctttt cccgggagca ggcccacaag gtctatgtcc
60

agcaccttct gaagagagac agggaacacc tgtggaagct gatccacgag ggcggtgccc
120

acatctatgt gtgcggggat gctcgaaata tggccaaaga tgtgcaaaac acattctatg
180

acattgtggc tgagttcggg cccatggagc acacccaggc tgtggactat gttaagaagc
240

tgatgaccaa gggccgctac tcactagatg tgtggagcta ggagcttacc aacctcccac
300

ccctcgg
307

<210> 390
<211> 248
<212> DNA
<213> Rattus norvegicus

<400> 390

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60

ctactcagtg tccagccctg tggatcctaa caccattgat atgactccca aggagagtgg
120

attagccaaa gtagccccag tgtacaagat ttgctttgta gcccgctgat tgtgctgagg
180

cagtcagccg actcacttct gttcaaaatg gccccatttt tctgattctg ggagacctgc
240

tggagacc
248

<210> 391
<211> 283
<212> DNA
<213> Rattus norvegicus

<400> 391

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tttgtaaaca cattgaggtt cagcatgggc tactccatgg agaaatactg cggccaactt
120

ccagttccac tttcgtatgt accggttgtc agggtgaact aacagaccat atgaccttta
180

cagagagggt gaaaaatatg atgctttcac tgtttttttga gttttggctc cagcaatatg
240

actttgcatt ctgggatcag ttttacagta aaactctagg aag
283

<210> 392
<211> 290
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 392

ggactatctc cccttaagtg ggaagggctt agtcaaatgc agtanagagc tataaaacac
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cgagaactct tgatgtgttg tgaaacttag agggagcagc tttttaacaa gagaactcaa
120

gcaattgctg ccatgccggg gaagccagtc cttcactact tcgatggcag ggggagaatg
180

gagcccatcc ggtggctcct ggctgcagct ggagtagagt ttgaagaaca atttctgaaa
240

actcgggatg acctggccag gctaaggaat gatgggagtt tgatgttcca
290

<210> 393
<211> 281
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 393

ttgcactacc ctgcaaggct gtgttgcagg gcccggaagg ctcactgttc cgaaatggcc
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gagcagtcag acaaggatgt gaagtactac actctggang gagattcaga agcacaaaga
120

cagcaagagc acctgggtga tcctacatca taagtgtacg atctgaccaa gtttctcgaa
180

gagcatcctg gtggggaaga agtcctaaga gagcaagctg gggtgatgc tactgagaac
240

ttgaggacgt ccgggcactc taacggatgc acgagaactg t
281

<210> 394
<211> 287
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 394

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ctatttatat cttcgccaag aagaacaata tcccnttcca gatgcatact gtggagctgc
120

gcaagggtga gcacctcagc gatgctttgc ccagtgaacc ccatgaagaa ggtaccagcc
180

atgaaggatg gtggcttcac cttgtgtgag agtgtggcca tcctgctcta cctggcgcac
240

aagtataagg ttcctgacca ctggtacccc caagactgca ggcccgt
287

<210> 395
<211> 293

<212> DNA
<213> Rattus norvegicus

<400> 395

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actcccagaa ttccaaagtc aaagactctc ataaagcatt atccgatgtg gagattgtgg 120

cccagtcagt tatcttcatt tttgccggct atgagaccac tagcagtgct ctttcctttg 180

ttttgtattt gctggccatt caccctgata tacagaagaa actgcaggat gaaattgatg 240

cagctctccc caataaggca catgccacct atgataccct gctacaaatg gag 293

<210> 396
<211> 266
<212> DNA
<213> Rattus norvegicus

<400> 396

gttggcctcc caataagtag ggtcaacatt tagtcaaaat atgcgattgt tgcaaagctt 60

tcgaaggctg gctttgtggg tacagtgtat ccatagatgc ctgaattaac tgaagatctt 120

aactgcagat tctacacatt tctcatcctc taatggcttc ctctggctgc ccagggctga 180

agaaacttct tcactgtggg gaggttgctg actctggttc tccagggcct cagcagaggg 240

aagttggcca aagcgtgggg tccact 266

<210> 397
<211> 259
<212> DNA
<213> Rattus norvegicus

<400> 397

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cactccggtt cccatggtat ttatgaagga atatgcaatg gggttccaat ggtgatgatg 120

cccttgtttg gtgatcagat ggacaacgcc aagcgcatgg aaactcgggg agctggggtg
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accctgaatg tcctggaaat gactgccgat gatttggaaa acgcccttaa aactgtcatc
240

aataacaaga gttacaagg
259

<210> 398
<211> 252
<212> DNA
<213> Rattus norvegicus

<400> 398

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60

gagagggcct ggcccgcatg cagttgtttc tattcttgac aaccatttta cagaacttta
120

acctgaaatc tctggttcac ccaaaggaca ttgatacgat gccagttctg aatggttttg
180

cctctctgcc acccacttac cagctctgct tcattccttc ctgaatagat caggcatttt
240

ggctctactg tg
252

<210> 399
<211> 272
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 399

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ttctatngaa tcagcaccat gtcagangga agctcccacc nggtcccact cctctaccaa
120

tttttggcaa tattttgcaa ntgggtgtta aaaatatcag caaatctatg tgcatgcnag
180

cgaaagagta cgggcctggn tcaccatgta tctgggcatg aagcccactg tggtgctgta
240

tggatatgaa gtattgaaag aagctctgat tg
272

<210> 400
<211> 294
<212> DNA
<213> Rattus norvegicus

<400> 400

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ggacaagaag tacagcatgg gggatgctcc cgactatgac agaagccagt ggctgagtga
120

gaagttcaaa ctgggcctgg acttccccaa tctgccctac ttaattgatg ggtcacacaa
180

gatcacccag agcaatgcca tcctgcgcta ccttggccgg aagcacaacc tttgtgggga
240

gacagaggag gagaggattc gtgtggacgt tttggagaac caggctatgg acac
294

<210> 401
<211> 276
<212> DNA
<213> Rattus norvegicus

<400> 401

gctgcgagca ggtctgaccc attgctctct ctgctcagag ttccccaggt ctgaagtctg
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cctgaaagat gtcagccctc aaagctgtct tccagtacat tgacgaaaac caggaccgct
120

ttgtcaagaa acttgcagaa tgggtggcca tccagagcgt gtccgcgtgg ccggagaaga
180

gaggagagat cagaaggatg acggaagcgg cagtgcagat gtccagaggc tggggggatc
240

tgtggagctg gtggatatcg ggaagcagaa gctccc
276

<210> 402
<211> 271
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 402

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60

aggnctgttn ggctaaaggt cnctttgaag cccagtgtct anagtcacac cttctttgct
120

ctgggcccag gaggcctact tcttcttttt ctcgnggaat cctggaatct taaagataaa
180

agaacctaga aagaaaatca aacccacttt ccttgtgggg cagatggtaa tatgggactg
240

agaacagcaa acctggggtc ttggagagga g
271

<210> 403
<211> 253
<212> DNA
<213> Rattus norvegicus

<400> 403

cgcactgctc ctagggcaag agccttcacc tcttctacag ccaacaccat gcgcgagatc
60

gtgcacatcc aggcgggcca atgcggcaac cagatcggcg ctaaggcaac aaatatgtac
120

ctcgggccat cctagtggac ctggagccag gcaccatgga ctcagtgagg tcgggaccat
180

tcggccagat cttcaggcca gacaactttg tgttcggtca gagtggtgca ggaaataact
240

gggcaaaggg cca
253

<210> 404
<211> 312
<212> DNA
<213> Rattus norvegicus

<400> 404

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gggattcaag ccgctgggct gcagtctccc ttctctctgc ctgtcagcaa agttattttg
120

ctttgcaagt cggacgagta agattaaaat acaagatcgc acctccagca gtcacgggct
180

ctctggagtt tgagagaata tttcgcgcac agcaaaactc tttggagttt tattccgtat
240

tcatcatatc gctgtggatg gctggatggt atttcaatca agtttttgca acctgtctgg
300

gtctcctgta ca
312

<210> 405
<211> 245
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 405

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60

tcgcccgacn gcgccatgga gggttaccat aagccagatc agcagaagct ccaggccctg
120

aaggacacag ccaatcgcct gcgcatcagc atccanncca ggccaccacc gcggcaggcg
180

nggacacccc acatcttgna gtagcgcngn cggagagcng gtcgnnctgn tattnnnnac
240

caggc
245

<210> 406
<211> 299
<212> DNA
<213> Rattus norvegicus

<400> 406

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60

aattccccaa cccagagatg tttgacccag gtcactttct agatgagaat ggaaacttta
120

agaaaagtga ctacttcatg cctttctcag caggaaaacg gaaatgtgtg ggagagggcc
180

ttgccagtat ggagctgttt ttgttcctga ccaccatttt acagaatttc aaactgaaat
240

ctctgtctga tccaaaggac atcgatataa actcaatacg ttctgagttt tcatcaatc
299

<210> 407
<211> 290
<212> DNA
<213> Rattus norvegicus

<400> 407

ggaaggggaa gaatgccagt ttttgaaaag gctactaaag gactgggcat tagttttagc
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cgtggaaatg tatggagagc cacaagacat ttcacagtca ataccctgag gagtttgggc
120

atggggaaac ggaccattga gatcaaagtg caagaggaag cagagtggct agtgatggaa
180

ctgaagaaaa ccaaaggctc accctgtgat cccaaattca tcataggatg tgctccctgc
240

aatgtcatct gctccattat cttccagaat cgtttcgatt ataaagataa
290

<210> 408
<211> 221
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 408

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ttttgntngc tngggcantg gnaaccngga agnccnntgg aganttccan aaaagaaaaa
120

atttaggggc acaaatgtga gaaaaancnt cacaancttn gggnanannc cccctgntgc
180

gcctnttgtg gggctgccct atgtccaatc cagctatatt g
221

<210> 409
<211> 116
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 409

attttgagat ggaacgattt gaagtcttgg gtgtccccttt cagtctccaa ctttgggaca
60

ctgctggtca ggagaggttc aagtgcatcg cttccacaca acatangagn gnnatt
116

<210> 410
<211> 275
<212> DNA

<213> Rattus norvegicus

<223> unsure at all n locations
<400> 410

cacagccccct accagcncac cctccataac tgcaccaaga ggatctatcc aacacctccc
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tgagcaggag gagcctgaag actccaaggg aaagagtcct gaggaaccct ttcctgtgca
120

gctggatcta accacaaacc cacagggtga cacactggat gtctccttcc tctacctgga
180

gcctgaggaa aagaaactgg tggtcctgcc tttccctggg aaggaacagc gctcccctga
240

gtgcccgggg cccgaaaagc aaagaacccc ctgat
275

<210> 411
<211> 300
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 411

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tccaggccag tgtttctgtg gaccggctgg agaggtattt gggaggagac gatttagaca
120

catctgccat tcgccgcgtc agcaatttttg ataaagctgt gaagttttca gaggcctctt
180

ttacttgggc ccggacttgg aagccacaat ccaagatgtg aacctggaca taaagccagg
240

ccaatggtgg ctgtggtggg cactgtagct ctgggaaatc ctctttggta tcagccatgt
300

<210> 412
<211> 286
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 412

cnagaagtta gtggagtact tgaagcagag ttcgttgatg ctgtgtttct ggatcctttt
60

gatgtgtgtg ggctaactgg tgccaagtac tttctctccc gtcagtggtc ttcagcaggg
120

ggatatttcg tcactatctt gaagaangct cccagtgccc cagtcctcct tcatatgtcc
180

ccagaggtat cttgaaactc acagatacca tgactttcaa ggaaagagtg tggaacttct
240

ttcctaatgg gggagcatgc attctgtccc agtttttcaa aactgc
286

<210> 413
<211> 272
<212> DNA
<213> Rattus norvegicus

<400> 413

agagaagcct gctgaggaaa cactggaaag ccttacctca ggcactaagt tgaaggaaaa
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acgacaatgg ccacaatggt agaactgagc cctacaagtg agcagtgtga gtttgtccta
120

ggtctgccag tgaataagaa gacccctccc cggaaagtcc cgagtttatg ttccatgcgc
180

tattcaatag ccttcatcgc acatatctgc aacttcacat tgatagcaca gaattccatc
240

ataagcatca ccatggtagc catggtcaac aa
272

<210> 414
<211> 103
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 414

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60

tggtcttcct gacaggttgc caagcttggg agttctggca gca
103

<210> 415
<211> 273
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations

<400> 415

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agccttcaca aggaccgtcc tatcgagcct ctggacctgg ctgtgttctg ggtggagtac
120

gtgatgaggc acaaggnggc gccacacctg cgccccgccg cccacgacct cacctggtac
180

cagtaccact ccttggacgt gattggcttt ctcctggcca tcgtgttgac ggtggtcttc
240

attgtctata aaagttgtgc ctatggctgc cgg
273

<210> 416
<211> 106
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 416

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tcaggatgaa anctgcagtg gtggctgnag gnnctggtct ncctga
106

<210> 417
<211> 294
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 417

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acacaagggc cctagctatg gagtgcgtat tccacagaca cctatggtta ccttggatac
120

tgccaaaact cttaaataca tggactttta cctcagaaac ttgtcttcag atatcctgtt
180

aatcttcagt ttttgtttgt ttttgttttt nggaggaagg cctctctcta tgtagctatg
240

gctgtcctag aatcactctg tagatcaggc tggcctcaga ctcatgcctc tgct
294

<210> 418
<211> 262
<212> DNA
<213> Rattus norvegicus

<400> 418

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cagattcgcg gacccggggc tgcctcttta agggaggggg tggagccacg agtgaggatc
120

gaaaagctcc agaaaacttg aggccagagc cccgcaccag ggtgcagcca tgagtgcgga
180

ggtgaaggtg acagggcaga accaggagca atttctgctc cttgccaagt cggctaaggg
240

ggcagcactg gccacactca tc
262

<210> 419
<211> 145
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 419

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ctgggattca aaagncactt tnccaaaatg tnnggnaana attttgtggn cnanccccga
120

nttcatntga ncggcttanc ccagt
145

<210> 420
<211> 271
<212> DNA
<213> Rattus norvegicus

<400> 420

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gtgtggcaag gccttcatct ggagctctgt gctcatcgaa caccagcgca ttcacacagg
120

cgagaagccc tacaagtgtg aagactgcgg caaggccttc cgaggacggt cgcatttctt
180

ccggcactta cggacccaca cgggcgagaa gcccttctcc tgtggctcct gtggcaaagc
240

gtttggccag agctctcagc tcatccagca c
271

<210> 421
<211> 282
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 421

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60

ttgatgtgag tgggaagaat gggggagatt cgcagctttg tcctcatcac tgttgctctg
120

attctgggca aggagagctg ggtcctcgga gatgagaact gtttgcagga gcaggtgagg
180

ctcagggctc aggtgcgcca gcttgagacc cgggtcaaac aacaacgggt ggtgattgca
240

cagctcttgc acgagaagga ggtccagttc ctggatagag ga
282

<210> 422
<211> 222
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 422

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gancagagca ttgttcccca caccaccatc aaaggcatcc atgaactctt tgtgccggaa
120

aacaaaattg atcaaatccg agctgagtta gagactctcc catcactacc aattaccaag
180

ctggatctgc agtgggtgca gattctgagc gaaggctggg cc
222

<210> 423
<211> 275
<212> DNA
<213> Rattus norvegicus

<400> 423

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ccccagccct gggacgctgg ttccgccatg caatcccttt cgctatcttc acgctgttac
120

ttctttatat cagtgtatgg ctcttccatg agtggccctt tgagttgcca gctcaaagaa
180

ctcagcagtc cggcctgtgg gaactcaagc tctcttctcc ttctccagcc ctcacctctc
240

tgcttcctgt cacctcaggt gttttacaag gctga
275

<210> 424
<211> 279
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 424

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gagtatttta agccttgttt aaaacatctt tttactccan nnnnnnnnnn nnnnnnnnnn
120

nncaaactaa atcattgtag ctaacctgta atatacgtag tagttgacct ggaaaagttg
180

taaaaatatn gctttaaccg acacgtaaat atttcagata aacattatat tctttgtata
240

taaaanaaag aaaannangn caatggnnga atnaactct
279

<210> 425
<211> 288
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 425

gtgttcgcag gttcccagca ctcttgccga aggactcttg tccttctcta ccagagcagc
60

atangaggga atggctgccg tgtctccacc taccagatgt caggcatcgg tgacgtttga
120

agatgtggct gtgaccttca cagatgacga gtggaagcgt ctggtaccca tgcagagagc
180

actctacaag accgtgatgc tggagaacta tgagagcatc atctctctgg ggcttcccgt
240

tcctcgacct gatgtgattc ttcagttcaa gagaaggggc gaatcctg
288

<210> 426
<211> 286
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 426

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60

gggggcaggc ctganggcca ccatcttctg catcctgacc tgggtcagcc tgacagctgg
120

ggaccgcgta tacatccacc cctttcatct cctctactac agcaaganca nctgcgccca
180

gctggagaac cccagtgtgg agacgctccc agagccaacc tttgagcctg tgcccattca
240

ggccaagacc tcccccgtgg atgagaagac cctgcgagat aagtcg
286

<210> 427
<211> 235
<212> DNA
<213> Rattus norvegicus

<400> 427

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60

agggagccag agggcctcac aacaacagag ggtctcagag ctccctggag gaaggctcag
120

ttacaggctc agaggctcgg cacagcttag gtgtcctgaa tgtgtccttc agcgtcagaa
180

ccgtgtcggg ccctggtgga acatcaaatc atgccagcag aagtgggaca ggaaa
235

<210> 428
<211> 249
<212> DNA

<213> Rattus norvegicus

<400> 428

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aaggacgttc agaactacta tgggaatgta ctgaagacat ctgcagacct ccagactaat
120

gcttgtgtca ccccagccaa gggggtccct gagtacatcc ggaaaagtct gcagaatgta
180

catgaagaag ttatttccag gtattatggc tgcggtctgg tggtgcctga gcatctggaa
240

aactgccgg
249

<210> 429
<211> 233
<212> DNA
<213> Rattus norvegicus

<400> 429

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60

aaactccatt aggcacagtg acatacatgt gtaattcaaa cgctgcactt gagagactga
120

ggcaggagga gatctatcga aaggttgaga ccaactagct gtaggctagc ctgggctatg
180

ctgttaagac cttgtcacaa agtacaagaa gggagaataa aagaatattt cct
233

<210> 430
<211> 287
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 430

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gtgcacatct atgttttcat atctaccggt tgggtatgcc tttgtccctg ggtagggact
120

ggctctctgg acaagtagat gtcctgttag cctgcagaca tcacatgact ctcaagaacg
180

aatcgtgtat cctggtccct gctcctgtgc atgcacattc ccctcctctg tcccgaggca
240

gaggcaaggg tgtgtgaggc ctatgggcag aggccatatt gtgaaga
287

<210> 431
<211> 183
<212> DNA
<213> Rattus norvegicus

<400> 431

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tcagatctag tgtggtggat gatagaagtt gaacttgctt tattgctatg tgttaaaata
120

ttttgtttgc attaaatggc ctattgaaat gcttttctgt tcctataata aaataacctg
180

atg
183

<210> 432
<211> 287
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 432

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gtgcacatct atgttttcat atctaccggt tgggtatgcc tttgtccctg ggtagggact
120

ggctctctgg acaagtagat gtcctgttag cctgcagaca tcacatgact ctcaagaacg
180

aatcgtgtat cctggtccct gctcctgtgc atgcacattc ccctcctctg tcccgaggca
240

gaggcaaggg tgtgtgaggc ctatgggcag aggccatatt gtgaaga
287

<210> 433
<211> 283
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations

<400> 433

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ttggaccttc accagtccng gggnggctgg gactcccaca cctcaagccc gagctatgac
120

ttacattcca ctgctgggag aagagaggcg gggcccagag tatcctgccc ttgggagtca
180

aagaccctag gngccaggct ggcacaggga tggggaggct ggncttttat aaatatnata
240

tgcagannaa aagannaaaa naagggcggc cnccgacaag nna
283

<210> 434
<211> 295
<212> DNA
<213> Rattus norvegicus

<400> 434

aagatcggaa gaatcacagg gctggaccct gcaggaccta tgtttgaggg aacttccccc
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aacgagcgcc tttctccaga tgatgccaat tttgtggatg ctattcatac ctttaccagg
120

gagcacatgg gtctgagtgt gggcatcaaa cagcccattg cccactatga cttctacccc
180

aacgggggct ccttccagcc tggctgccac ttcctggagc tctacaaaca cattgcagag
240

catgggctta aatgccataa cccagaccat caaatgtgcc catgagcgtt ctgtg
295

<210> 435
<211> 133
<212> DNA
<213> Rattus norvegicus

<400> 435

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ggtaaccttg acatcacaga actgctagtg aacgaggtaa aaataataaa ggtacaacca
120

gtgcatcgca aaa
133

<210> 436
<211> 212
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 436

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tcaccagccg acaggaacgt gcagggagag tctggttcta gggccaactt gtgggatgct
120

cccttgagct gggccacacg cttggtgttc ttgcagcact gtgtagcang cttctcctgc
180

gactcggacc tgcccatccc ggcacacata gc
212

<210> 437
<211> 291
<212> DNA
<213> Rattus norvegicus

<400> 437

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60

aatgggggag cagccctttt ggtgttgcaa aatgaagttc caggcttcta aaatgttgcc
120

atgtattgaa aggagctaat gccattgtaa atgttattag tttcacattt cttgagcagc
180

ctagagtaca gggtgaacat ttgtagatct tgtaatgatg tattgtgctg tggaagtact
240

gtgtgtgaat agcagtagtg gggcaaaaag caatcttgtc attggaatgt a
291

<210> 438
<211> 262
<212> DNA
<213> Rattus norvegicus

<400> 438

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gtccacgttg ggcagcacac aagtgtccgt aactctagct ctatgggatc tgacccattt
120

ctggcctctt cagcacctgc acaaatgtgg cagacacata tacgcttaag taaaaataat
180

taaaaaaaac gaatctttaa aacattttt aaaagaagtg atggagtgaa ttcctgcctt
240

atggcctgct ggaaatggaa ca
262

<210> 439
<211> 272
<212> DNA
<213> Rattus norvegicus

<400> 439

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agtaggaaga ggggcataga gagctgtgcc tctatggtga gcctctggga ctgaagtttg
120

ccacgactag tggttggaca cctgggaggc tggctaccta cctgtcttac tccctgaagg
180

acagggttga atctctgggt tccagtcctt agggagatgg agtactgtct gtcagctgct
240

ggctgtgctt tttgaagagg ccaaattgtt tc
272

<210> 440
<211> 284
<212> DNA
<213> Rattus norvegicus

<400> 440

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agccagagca agtgaggact gagcaaggga agggagaacc gattgccatc ggccttcatg
120

ctctggttag ggtgaggttg gggccaagag gactgggcct ggcagatctt caagtcattg
180

ggaagatgga gataccactg taggggtgaa caccgggaga cctaggagat cccctcccca
240

ccctttctct tggcctccga ttcactcctg tcccgttccc tgac
284

<210> 441
<211> 233
<212> DNA
<213> Rattus norvegicus

<400> 441

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aaactccatt aggcacagtg acatacatgt gtaattcaaa cgctgcactt gagagactga
120

ggcaggagga gatctatcga aaggttgaga ccaactagct gtaggctagc ctgggctatg
180

ctgttaagac cttgtcacaa agtacaagaa gggagaataa aagaatattt cct
233

<210> 442
<211> 273
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 442

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tccattcaga gcaagtgttt gcncttcgcc tgcaggacaa aaaacttccc cctctgctct
120

ccgagatctg ggatgtccac gaatgactgt ttctccgtgt cctcngtgtt ggcaaggcag
180

ctgaagttac nganngcttc nnngaagngg nanannctgg ggagagaaaa nntncagggg
240

gncgaggaaa agagacnctt ntnnngnaan aag
273

<210> 443
<211> 264
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 443

gnaagaagga aggttctctc ttcacctgct tctatttact tgccagcaca tctgttggga
60

tctactaacc ttgtgagatg gagcaactac tagatccttg gacttcccac tcatagctga
120

tcattgttag ggggttggac tacagactgt aaatcatcat aacaaactcc cttactgtat
180

agaggctatc cataagttct gtgactctag agaaccctga ctactacaga ccctgtttca
240

aaaaagaagc aaaagttagc tggg
264

<210> 444
<211> 283
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 444

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60

cactacagga ggaattgttc catctgagag acccagcatg cattatactc gctgtctgct
120

gcttctcctg gctggactct tggaactctc tcacagtcag ccagaccaag aagagcctga
180

caatacaacc aaccaaacct acagttgttc tcacagcaga acatctccag ctaccagatt
240

gcctctggna atgccaactt tgccttccgc ctctaccacc tga
283

<210> 445
<211> 290
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 445

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aatatcacaa tctcataagg natggggaat acagacnagg tacnttttca ggcacattca
120

gtgtaaatat atgtagtcat ttatactgnn atattaaata atattatatt tgtgaagaca
180

gagatttatg tcttacaatg taaatganaa acagacaaac ctaatcagat atctggctgg
240

tgaagccatt ggtcagtgtt aggaatttcc agtcaggaga agaccctcta
290

<210> 446
<211> 165
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 446

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aaaccgagaa agganataac atttgaaatg taaatgaaaa atatccaatt aaaaaaaaaa
120

aancaaaccc tgcccagant tttgccngng ngacaaaaan agaga
165

<210> 447
<211> 173
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 447

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aggaacgtgt gcggactgca gtccctccca agaccataga ggagtgtgag gtgattctga
120

tggtgggact tcctggatct ggaaagaccc agtgggcact gaaatatgca aaa
173

<210> 448
<211> 189
<212> DNA
<213> Rattus norvegicus

<400> 448

gttattaagg ataaactgtt taatcaaatt aacgttgctt agttactgct gagtactctt
60

cctcagagct ggcgtgcgga aggagaagaa gctcaaggaa cattctaacc cagttaccag
120

aactcagata gaagactaag gtgctgtgtg acgtcctgag tattagcact gtaataaaac
180

tgtcacatg
189

<210> 449
<211> 165
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 449

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60

caaaaaacta nncngatgtn ccattcaaan gtggccttct gtacatcana ggnagattct
120

ggctttctac ggcaccagaa gntgtttcac tggcnanaan aaant
165

<210> 450
<211> 184
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 450

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aacaaagaat tactgattca gctacgcagc agaacatatg tgctctactc tttcaagatt
120

aataatcttg ctttatgtca tattgtatat ttaatcttag tctgttgcng gggagggtct
180

atgc
184

<210> 451
<211> 271
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 451

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60

ttctgtgctg aggcctggcc cacgtcacaa gcatttcctt ccagacccac aacctccagg
120

gactgggaca aactggggca ggatgatttg ccacttgctt ggcccgctga tcccagcccg
180

atacctctcc tctctactct cccaggagac tctcaggccc agtgtgaccc tggggcttgg
240

ctgagaagct gacccagccc cagggccagc a
271

<210> 452
<211> 103
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 452

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60

aaggcccaca gaagattcag ctgaagacgg tgatgggtga tct
103

<210> 453
<211> 284
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 453

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tctgtcccca aaatgcctgt ggacttcaac gggtactgga agatgctgag caacgagaat
120

ttcgaggagt acctgcgtgc gctcgatgtc aacgtggcct tgcgaaaaat cgccaacttg
180

ctgaagccgg acaaagagat cgtgcaggat ggcgaccaca tgatcatccg cacgctgagc
240

acttttcgaa actatatcat ggacttccaa gttgggaagg agtt
284

<210> 454
<211> 277
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 454

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60

caagaataca acagctagtg aaccgtagca gcatgcgaag aggggctgta actatcacca 120

tacatgcact gtcccgtgga ggtgtgacac gggagacgtg tggatcatgt gatcattgtg 180

aacaccttgt gagctttaaa ataaagtcca ccctgtggtg tcaaaaaana aaaaananan 240

nannaggagn nannannncn ggattangga ccncccc 277

<210> 455
<211> 155
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 455

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nggccatgta gctgccagga ctgctctgcc gtctgcngtc ccaaacccca tccccaccaa 120

tccctgacac actaataaag gctttgtgac ctcaa 155

<210> 456
<211> 277
<212> DNA
<213> Rattus norvegicus

<400> 456

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ggggtggtgt ggcgggtgcc atggaagtgg taatgcatgt gttgatgcag ggattatgca 120

agctgaaact tgttctcagg ggccatgtca gatgtgtgag aatacctgga ctcctggttt 180

tcctccatag taaaggggtg ttctcccact ctctacaagt ctcttcatgc cagagggttt 240

tcaagactcc catttagtgg ccaggaggat ttcattg 277

<210> 457
<211> 277
<212> DNA

<213> Rattus norvegicus

<223> unsure at all n locations
<400> 457

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cgtgtgtgta agtgtgggtg tgtgtgcgtg ctctgctcat ctctagggaa cttcgaggtg 120

ggaagtggga ggtgggaggt ggagggaccc agtagtgaga agaactagga ggtgaggcct 180

aatgggccgc agattggtca tgttttggtg ctgatgacag aggggccagt cccaggggag 240

gaggcttngc gggccnactt tnttgtctcc tgtcgna 277

<210> 458
<211> 233
<212> DNA
<213> Rattus norvegicus

<400> 458

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caaatatata ttcagtgcta aaaaaacaaa atcctgtgtt cagtttagaa tgttttgatg 120

tagctgagaa gctttgccca acaacaataa ctgaagctac tgtagttcat aaagttcaca 180

tggctttata gcctttgcaa aacatatcta taaatcaatt actttttgaa aat 233

<210> 459
<211> 294
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 459

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gtcacccgta atccaccgcc ctggccgagg aaggcatagc tgctggaggt gtaatggacg 120

tcaacactgc tctacaagag gtgctgaaga ccgccctcat ccacgatggc ctagcacgtg 180

gcatacgcga agtgccaaag ccttagacaa gcgccaagcc catctctgcg tgcttgcatc
240

caatgtgatg agcccatgta tgtcaagctg gtgnnggcct ttttnccgaa caaa
294

<210> 460
<211> 300
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 460

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60

gagaaccaac catgggcagc tttactaagg aagagttgac tgccatatcc tcgatgaagg
120

nttcactgct aaggacattc tggaccaaaa aatcaatgaa gttctcctct gatgataagg
180

atgctttcta tgttgcggac ctcggagacg ttctaaagaa gcatctgagg tggctgaaag
240

tcttccccgt gtactccctt ctagctgtca gtgtatgaca gcgagccata gtgagcacct
300

<210> 461
<211> 121
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 461

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60

atgtccgtca gggtgacnca gaaatcctan aagangtcca cctcnggtcc ccgggacttc
120

a
121

<210> 462
<211> 133
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 462

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60

gacccctata actccnnnag gctgtcctca gcttgngnac agcctnagcc actccaaant
120

tngatcaaac gtt
133

<210> 463
<211> 281
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 463

cnggcggcgg acgacgttcg tcatttggtg cgggagggng cgcgagangg tgcgtcgagc
60

ctccggtgtc ccaaactaga ggtgagcatg gcagaacagg aacccactgc tgagcagctc
120

gctcagatag ctggagagaa tgaggaagac gagcactctg tgaactacaa gcctccagcc
180

cagaagagca tccaggagat ccaggaactg gacaaggatg atgaaagcct tcgaaagtac
240

aaggnggccc tgctgggccg agtagctgtc tctgcagacc c
281

<210> 464
<211> 264
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 464

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60

tgcctancaa tgaccaccca gcagantgtt ctccagggcc cgggacccng gggtttccga
120

ntcgtgggcg gcaaggactt tgagcaacct ctcgccattt cccgggtcac tcccgggagc
180

aaggntgnta tagctaactt atgcatagga gatttnatca cagccattga tggggnagat
240

accancagta tgacaaatnn gaag
264

<210> 465
<211> 277
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 465

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60

tgtccacgaa atcctgtgca acnctcagct tggagggtga tcattctaca cccccaagtg
120

ccnatgggtc ggtcaaaccc tacaccaact tcgacgntga gagggatgct ttgaacattg
180

aaacagcaat caagaccaaa ggcgtggacg aggtcaccat tgtcaacatt ctgactaacc
240

gcagcaatgc acagaggcag gacattgcct tcgccta
277

<210> 466
<211> 249
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 466

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60

ctcaccgtga ccaagtttct ctgagtgtcc agccaaccca ggctcaccag ctccctcnag
120

ctaccgcncg tccatcaggt caactgccaa ccccaggctg aanaccaaac ccagctatga
180

gctcctggag gcatgactcc ctcagggcca gcagctccga tccctcccag tagtgatcat
240

gggcnaggg
249

<210> 467
<211> 253
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 467

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tcctgcgagt actccaacac caacatcgat gggcggcgga aaatagcctt cgctatcact
120

gccattaagg ttctggccaa cggtctagac aacaagctgc gtgaggacct ggagcggctg
180

aagaaaatcc gagcccatag agggctgcgc cacttttggg gccttcgtgt ccggggtcag
240

cacaccaaga cat
253

<210> 468
<211> 301
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 468

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60

cttccccgtg ttactccctt ctatgctgtc aagtgtaatg acagcagagc catagtgagc
120

accctggctg ccattgggac aggatttgat tgtgcaagca agactgaaat acagttggtg
180

caggggcttg gggtgcctcc agagaggatt atctatgcaa atccttgtaa gcnagtgtct
240

cagatcaagt atgctgccag taatggagtc cagatgatga cttttgacag tgaaattgag
300

t
301

<210> 469
<211> 136
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 469

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60

gcttggctcc ctaagctatc cggtgccatc cttgtcgntg cggcgacact cgcaacatct
120

gcagccatga ccgagc
136

<210> 470
<211> 147
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 470

attaaggaaa atggaggtct ggactcagag gaagtcttat cccnatgaag caaaaggatg
60

gatcnttgta aatacagagc tgagtatgnc tngtggctaa acgancacag ggtntgtggt
120

atcccctcng caaagagtna ngccttc
147

<210> 471
<211> 294
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 471

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ggctgtncgc agctgcaccc gnccgtcctg tctgccgtgg gcttcactgg gtcaggcatt
120

ggcagctgca tcccatagcg ggncaagatg atgtctgctg cagcagttgc caacgggggc
180

ggagtcgncn caggaagcct tggtagccan actacagtcc antangtgta tttggnnttn
240

tccaacatna ancaacnatc catcttgggg tcttttggng naanccatna gagt
294

<210> 472
<211> 300
<212> DNA
<213> Rattus norvegicus

<223> unsure at all n locations
<400> 472

attccagcga gagacagagg gagtgagcgg gcgggttgga agagcccagt gtgcagagcc
60

ccactccggg cttcctagga aggcagctct ggagtgagaa gggctttgcc tccaggcttg
120

ctgcctcctc gacccaatcc tcccgctgac ccaacatcag cggtcgcaac cctcgccgcc
180

tctgggaaac tttgcccatt gcaacgggca gacacttctc actggaactt acaatctgcg
240

agccaggaca ggatccccag gcgcagggan ggaattttgt ctattgggac agtgttctct
300

<210> 473
<211> 276
<212> DNA
<213> Rattus norvegicus

<400> 473

gtccctcagc agtcctggat tcagaatgga accatcaaag acaacatcct gtttgggtcc
60

gaatacaatg aaaagaagta ccagcaagtt ctcaaagcat gcgctctcct cccagacttg
120

gaaatattgc ctggaggaga catggctgag atcggagaga aggggataaa tctcagtggt
180

ggtcagaagc agcgagtcag cctggccaga gctgcctatc aagatgctga catctatatt
240

ctggacgatc ccctgtcggc tgtggatgct catgtg
276

<210> 474
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gtgggaacgg tgacacttac tatctgtatg atgnccatga acatgttcac cggcaacaac
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ctttgagtga tccagcctcg atcaaaagaa ttgtcccgag tccccttcc cccaaagaga
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120

gctctccaca tgtcccagac ctnactctga ttgaccttcc tggtatcaca agagtggctg 180

tgggtgacca gcctgcagac atcgaacaca agatcaagan acttatcact gaatacatcc 240

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gaggcagaac aagcataggc gctttcagaa taccctagcc gtcctccgga agtctggttt 180

gntgggaatc actctgaaag ccaaggagtt gattcgtcag aaccaagcaa ctnaggtgna 240

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tacaaattac ttgtttatgg gagactatgt ggacagagga tattactcag ttgaaacagt 180

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gagctggtca gcacagcctg tggcttccgg ctgcaccatg gcacgaacat ccctttcaag
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(71) Applicant (*for all designated States except US*): **G.D. SEARLE & CO.** [US/US]; Corporate Patent Department, P.O. Box 5110, Chicago, IL 60680-5110 (US).

(72) Inventors; and
(75) Inventors/Applicants (*for US only*): **BUNCH, Roderick, T.** [US/US]; 1540 W. Dempster, Apt. 203, Mt. Prospect, IL 60056 (US). **CURTIS, Sandra, W.** [US/US]; 255 Creiner Court, Ellisville, MO 63021 (US). **RODI, Charles, P.** [US/US]; 706 E. Pacific Avenue, St. Louis, MO 63119 (US). **MORRIS, Dale, L.** [US/US]; 1754 Highview Circle Court, Ballwin, MO 63021 (US).

(74) Agents: **WILLIAMS, Roger, A.** et al.; G.D. Searle & Co., Corporate Patent Department, P.O. Box 5110, Chicago, IL 60680-5110 (US).

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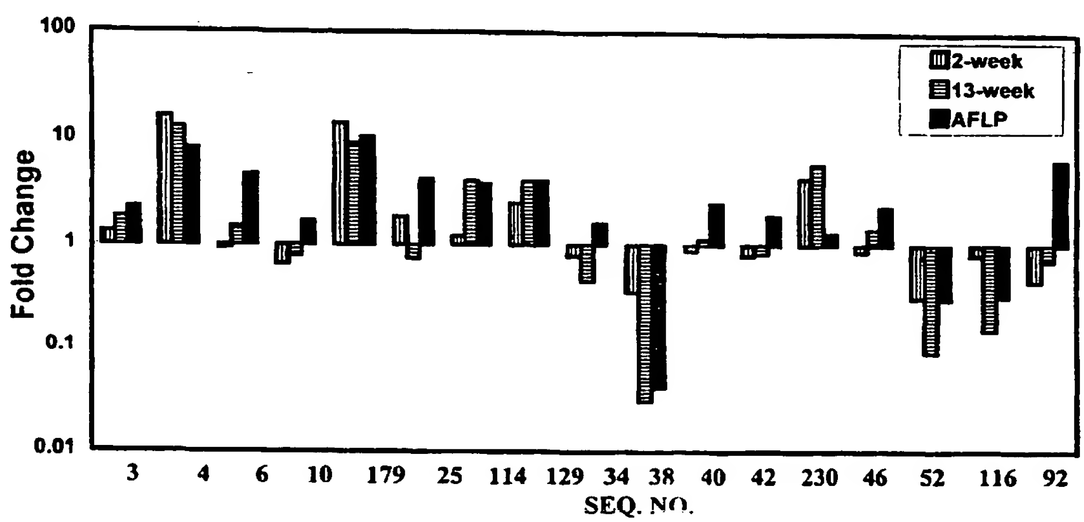
Published:
— *With international search report.*

(88) Date of publication of the international search report: 8 March 2001

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: BIOMARKERS AND ASSAYS FOR CARCINOGENESIS INDUCED BY PHENOBARBITOL



(57) Abstract: The present invention relates to carcinogenesis biomarkers produced by phenobarbitol-treated rat hepatocytes, nucleic acid molecules that encode carcinogenesis biomarkers or a fragment thereof and nucleic acid molecules that are useful as probes or primers for detecting or inducing carcinogenesis, respectively. The invention also relates to applications of the factor or fragment such as forming antibodies capable of binding the carcinogenesis biomarkers or fragments thereof.

WO 00/44902 A3

INTERNATIONAL SEARCH REPORT

International Application No
PL US 00/00503

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C12N15/12 C07K14/47 G01N33/50 C12Q1/68 C07K16/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C07K C12N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DATABASE EMEST7 [Online] EMBL, Heidelberg, Germany ID/AC AI179686, 12 October 1998 (1998-10-12) LEE N H ET AL.: "Rat spleen cDNA clone RSPCK43" XP002140091 abstract	1-16,19, 20,25, 29,30
X	WO 96 01324 A (INST NAT SANTE RECH MED ;BERLIOZ CLARISSE (FR); JACQUEMOUD SANDRIN) 18 January 1996 (1996-01-18) the whole document	1-7,10, 11,14, 19,20, 25,29,30

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 June 2000	25.09.00

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Oderwald, H

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	ROCKETT J C ET AL.: "Molecular profiling of non-genotoxic hepato-carcinogenesis using differential display reverse transcription-polymerase chain reaction (ddRT-PCR)" EUROPEAN JOURNAL OF DRUG METABOLISM AND PHARMACOKINETICS, vol. 22, no. 4, October 1997 (1997-10), pages 329-333, XP000914670 the whole document	
A	FORESTIER M AT EL.: "Application of mRNA differential display to liver cirrhosis: reduced fetuin expression in biliary cirrhosis in the rat" BIOCHEMICAL AND BIOPHYSICAL RESEARCH COMMUNICATIONS, vol. 225, 1996, pages 377-383, XP002140089 ISSN: 0006-291X the whole document	
A	FRUEH F W ET AL.: "Extent and character of phenobarbital-mediated changes in gene expression in the liver" MOLECULAR PHARMACOLOGY, vol. 51, no. 3, March 1997 (1997-03), pages 363-369, XP000914669 the whole document	
A	FRIEDBERG T ET AL.: "Isolation and characterization of cDNA clones for cytochrome P-450 immunochemically related to rat hepatic P-450 form PB-1" BIOCHEMISTRY, vol. 25, 1986, pages 7975-7983, XP002140090 the whole document	
A	CLARKE L AND WAXMAN D J: "Oxidative metabolism of cyclophosphamide: identification of the hepatic monooxygenase catalysts of drug activation" CANCER RESEARCH, vol. 49, no. 9, 1 May 1989 (1989-05-01), pages 2344-2350, XP000914667 the whole document	
A	RIEDL A G ET AL.: "Selective localization of P450 enzymes and NADPH-P450 oxidoreductase in rat basal ganglia using anti-peptide antisera" BRAIN RESEARCH, vol. 743, 1996, pages 324-328, XP000914666 the whole document	

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INTERNATIONAL SEARCH REPORT

International Application No
P. /US 00/00503

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	OMIECINSKI C J ET AL.: "Developmental expression and in situ localization of the phenobarbital-inducible rat hepatic mRNAs for cytochromes CYP2B1, CYP2B2, CYP2C6, and CYP3A1" MOLECULAR PHARMACOLOGY, vol. 38, no. 4, October 1990 (1990-10), pages 462-470, XP000914665 the whole document -----	

INTERNATIONAL SEARCH REPORT

I, national application No.
PCT/US 00/00503

Box I Ob ervation where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Claims 1-16, 19-33 (all partially)

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

1. Claims: Invention 1: {1-16, 19-33 all partially}

   A nucleic acid molecule comprising SEQ ID NO:1, fragments, homologues and complements thereof. A carinogenesis biomarker, a polypeptide, methods of diagnosis and isolating a nucleic acid, an antibody utilizing said nucleic acid molecule.

2. Claims: Invention 2: {1-16, 19-33 all partially}

   Idem as subject 1 but limited to SEQ ID NO: 2.

3. Claims: Invention 3: {1-16, 19-33 all partially}

   Idem as subject 1 but limited to SEQ ID NO: 3.

4. Claims: Invention 4: {1-33 all partially}

   Idem as subject 1 but limited to SEQ ID NO: 4, and primers and probes SEQ ID NO: 500, 529 and 560.

5. Claims: Invention 5-33: {1-16, 19-33 all partially}

   Idem as subject 1 but limited to each of SEQ ID NO: 5-33, wherein invention 5 is limited to SQ ID NO: 5, invention 6 is limited to SEQ ID NO: 6,....., invention 33 is limited to SEQ ID NO: 33.

6. Claims: Invention 34: {1-33 all partially}

   Idem as subject 1 but limited to SEQ ID NO: 34, and primers and probes SEQ ID NO: 490, 519 and 550.

7. Claims: Invention 35: {1-16, 19-33 all partially}

   Idem as subject 1 but limited to SEQ ID NO: 35.

8. Claims: Invention 36: {1-16, 19-33 all partially}

   Idem as subject 1 but limited to SEQ ID NO: 36.

9. Claims: Invention 37: {1-16, 19-33 all partially}

   Idem as subject 1 but limited to SEQ ID NO: 37.

10. Claims: Invention 38: {1-33 all partially}

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Idem as subject 1 but limited to SEQ ID NO: 38, and primers and probes SEQ ID NO: 508, 538 and 569.

11. Claims: Invention 39-113: {1-16, 19-33 all partially}

    Idem as subject 1 but limited to each of SEQ ID NO: 39-113, wherein invention 39 is limited to SQ ID NO: 39, invention 40 is limited to SEQ ID NO: 40,....., invention 113 is limited to SEQ ID NO: 113.

12. Claims: Invention 114: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 114, and primers and probes SEQ ID NO: 506, 536 and 567.

13. Claims: Invention 115-128: {1-16, 19-33 all partially}

    Idem as subject 1 but limited to each of SEQ ID NO: 115-128, wherein invention 115 is limited to SQ ID NO: 115, invention 116 is limited to SEQ ID NO: 116,....., invention 128 is limited to SEQ ID NO: 128.

14. Claims: Invention 129: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 129, and primers and probes SEQ ID NO: 509, 539 and 570.

15. Claims: Invention 130-229: {1-16, 19-33 all partially}

    Idem as subject 1 but limited to each of SEQ ID NO: 130-229, wherein invention 130 is limited to SQ ID NO: 130, invention 131 is limited to SEQ ID NO: 131,....., invention 229 is limited to SEQ ID NO: 229.

16. Claims: Invention 230: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 230, and primers and probes SEQ ID NO: 491, 520 and 551.

17. Claims: Invention 231-489: {1-16, 19-33 all partially}

    Idem as subject 1 but limited to each of SEQ ID NO: 231-489, wherein invention 231 is limited to SQ ID NO: 231, invention 232 is limited to SEQ ID NO: 232,....., invention 489 is limited to SEQ ID NO: 489.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

18. Claims: Invention 490: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 492, 521 and 552.

19. Claims: Invention 491: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 493, 522 and 553.

20. Claims: Invention 492: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 494, 523 and 554.

21. Claims: Invention 493: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 495, 524 and 555.

22. Claims: Invention 494: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 496, 525 and 556.

23. Claims: Invention 495: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 497, 526 and 557.

24. Claims: Invention 496: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 498, 527 and 558.

25. Claims: Invention 497: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 499, 528 and 559.

26. Claims: Invention 498: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 501, 530 and 561.

27. Claims: Invention 499: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 502, 531 and 562.

28. Claims: Invention 500: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 503, 532 and 563.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

29. Claims: Invention 501: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 533 and 564.

30. Claims: Invention 502: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 504, 534 and 565.

31. Claims: Invention 503: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 505, 535 and 566.

32. Claims: Invention 504: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 507, 537 and 568.

33. Claims: Invention 505: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 510, 540 and 571.

34. Claims: Invention 506: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 511, 541 and 572.

35. Claims: Invention 507: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 512, 542 and 573.

36. Claims: Invention 508: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 513, 543 and 574.

37. Claims: Invention 509: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 514, 544 and 575.

38. Claims: Invention 510: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 515, 545 and 576.

39. Claims: Invention 511: {1-33 all partially}

    Idem as subject 1 but limited to SEQ ID NO: 516, 546 and 577.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

40. Claims: Invention 512: {1-33 all partially}

Idem as subject 1 but limited to SEQ ID NO: 517, 547 and 578.

41. Claims: Invention 513: {1-33 all partially}

Idem as subject 1 but limited to SEQ ID NO: 518, 548 and 579.

42. Claims: Invention 514: {1-33 all partially}

Idem as subject 1 but limited to SEQ ID NO: 549 and 580.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PC US 00/00503

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9601324 A	18-01-1996	FR 2722208 A	12-01-1996
		AU 707874 B	22-07-1999
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		CA 2194155 A	18-01-1996
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		US 5925565 A	20-07-1999